THE MODEL ENGINEER

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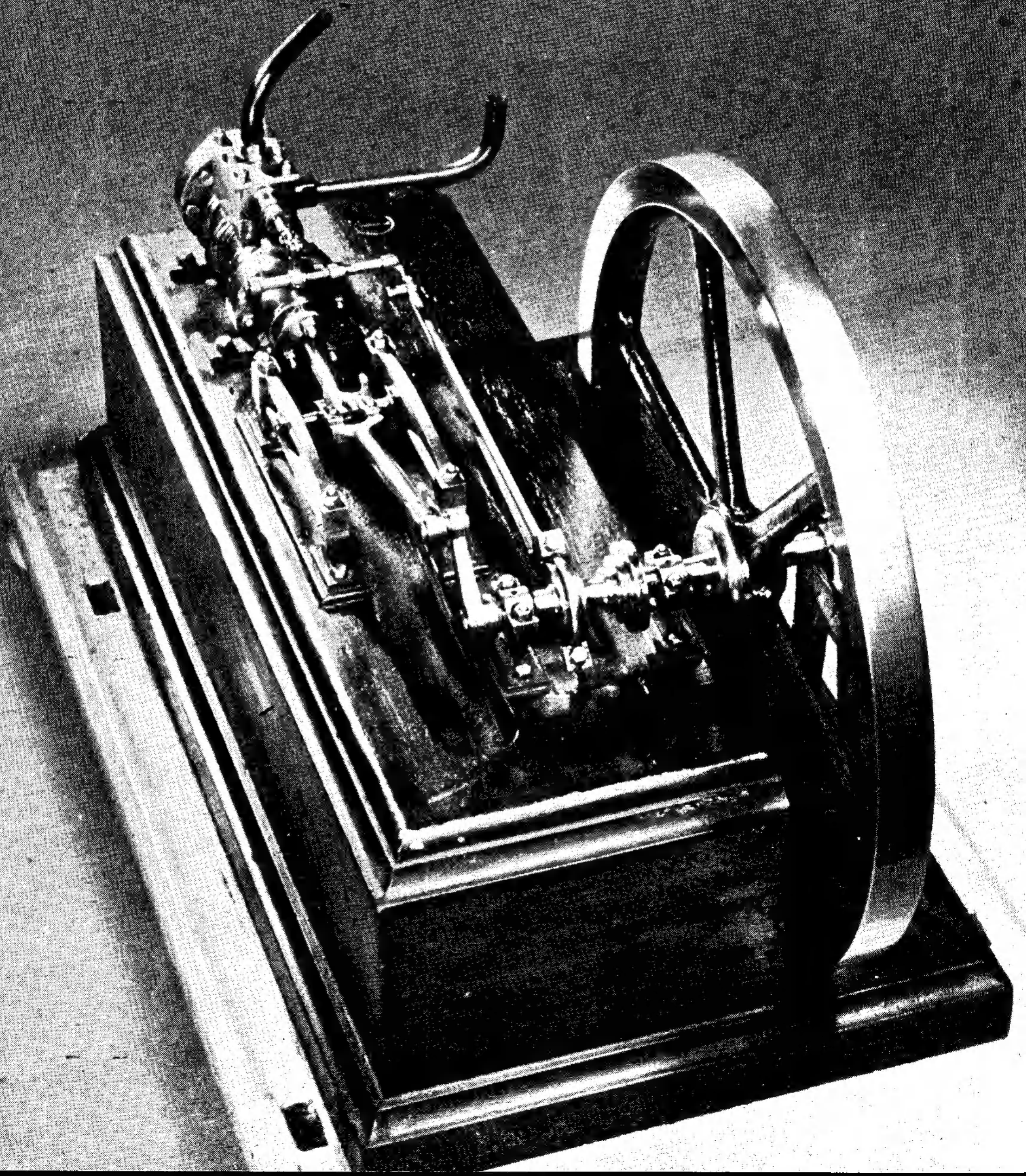


The MODEL ENGINEER

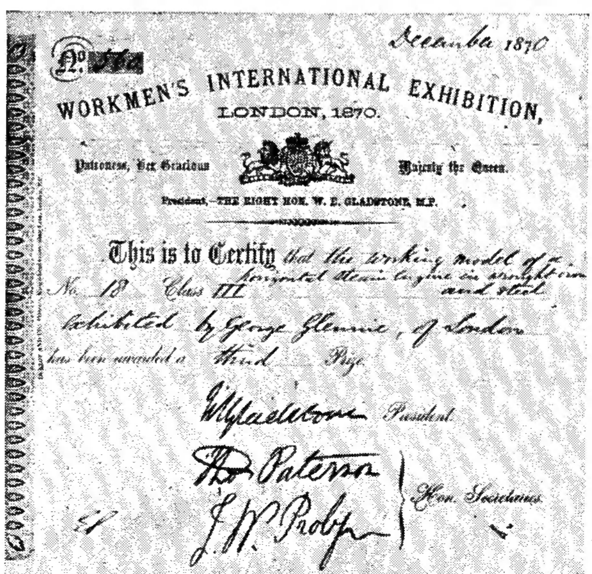
PERCIVAL MARSHALL & CO. LTD., 23, GREAT QUEEN ST., LONDON, W.C.2

14TH JUNE 1951 VOL. 104 NO. 2612

SMOKE RINGS

Our Cover Picture

● THE MODEL mill engine depicted this week is of more than usual interest. It has recently been presented to Mr. J. I. Austen-Walton by the Misses J. F. and E. M. Glenine, of Worthing, whose father built it about 100 years ago. He exhibited it in 1870, at the Workmen's Exhibition in London, where it gained third prize. The certificate for that prize is reproduced on this page and is of interest in that it bears the signature of the Rt. Hon. W. E. Gladstone, who was President of the Workmen's International Exhibition.


December 1870
WORKMEN'S INTERNATIONAL EXHIBITION,
LONDON, 1870.
Patroness, Her Gracious Majesty the Queen.
President,—THE RIGHT HON. W. E. GLADSTONE, M.P.
This is to Certify that the working model of a horizontal steam engine in wrought iron and steel No. 18 Class III exhibited by George Glennie, of London has been awarded a third Prize.
W. E. Gladstone President
Thos Paterson
J. W. Probyn
Hon. Secretaries

The engine which, according to the certificate, is "in wrought iron and steel," has the following dimensions: Cylinder, ¾ in. bore by 2 in. stroke; flywheel, 9 in. dia.; overall height, 9½ in.; bedplate, 12 in. by 7½ in. Mr. Austen-Walton has given it an overhaul and cleaning, and we are hoping that it will be on view at this year's "M.E." Exhibition.

The Glasgow S.M.E. Track

● THE LONG-AWAITED locomotive running track built by members of the Glasgow Society of Model Engineers was formally opened by Mr. J. N. Maskelyne on May 26th. The track is situated on a plot of ground alongside the Shawfield Chemical Works of J. & J. White Ltd., at Rutherglen, and from most points of view it is in an ideal situation. It boasts no scenic amenities, but it is well away from undesirable attention and ensures that members and their friends and guests have uninterrupted freedom when locomotive running and testing are taking place.

The usual 2½-in., 3½-in. and 5-in. gauges are available and the plan is in the form of an oval having slight indentations at each side, giving a shape which slightly resembles an hour-glass; the "mileage" is 788 ft. The elevation is some 2 ft. 6 in., on the average, above ground level, brick pillars at 6 ft. spacing being the primary support.

The building of this track has taken 12 years, but that is due to no fault of the society; the prevailing conditions during that period have more than accounted for the delay. The main object of the track henceforth is to provide facilities for the testing of locomotives with a view to obtaining definite information as to their performance and the conditions that affect it; and there can be little doubt but that, in due course, much useful data will be available from Glasgow to add to and compare with that obtained from similar experiments and investigations being made on some other tracks in Britain.

In the Glasgow S.M.E., there is already a remarkable variety of locomotives available, and more are well on the way to completion; but the members offer a cordial invitation to locomotive owners anywhere. And "cordial" is the right word, to judge from the warmth of the welcome given to Mr. Maskelyne, who was entertained in the most hospitable way and, in addition, was presented with a generous and lasting memento of the occasion.

More "M.E." Exhibition Prizes

● WE ARE grateful to acknowledge two additions to the prizes already announced. A. J. Reeves & Co., of Birmingham, offer a voucher, value £5 5s. 0d., for goods to be selected from their catalogue; it will be awarded in the "locomotive" class, 2½-in. to 5-in. gauge section.

W. K. Waugh, of Bearsden, Glasgow, has offered a set of castings, probably for the 3½-in. gauge *Britannia*, to be awarded at the discretion of the judges.

In these difficult times, such donations are generous, to say the least, and we hope there will be keen competition for them.

The Maudslay Scholarship

● THROUGH THE generosity of the Maudslay Society, the Junior Institution of Engineers is enabled to offer a scholarship, to be known as the "Maudslay Scholarship," to young engineers for the purpose of assisting them in their technical education and practical training. The amount will be £125 for one year and, subject to certain terms, will be awarded to a suitable candidate who must not have passed his 26th birthday and must be an engineer, or training to be an engineer wholly or mainly interested in mechanical engineering.

Applications for this scholarship should be made not later than July 31st, giving full particulars of the applicant, his general and technical education, the purpose for which he would use the grant, if awarded, and any other relevant information, together with two references, one at least of which should be from a member of the engineering profession.

Particulars of the terms upon which the scholarship is granted may be obtained from the Secretary, The Junior Institution of Engineers, 39, Victoria Street, London, S.W.1. Applicants need not be members of the Institution.

"Britannia's" Prowess

● WE WERE privileged, recently, to take part in a most enjoyable and interesting event. British Railways had invited a special party to attend at the Rugby Testing Plant where Class 7 4-6-2 engine No. 70005, *John Milton*, was under test. We were conveyed in two special coaches which were attached to the 10.30 Manchester express which was hauled by No. 70009, *Alfred the Great*, another of the Class 7 engines, with a dynamometer car coupled to her. The total load hauled was 495 tons, and five out-of-course delays, due to engineering work in progress, hampered the outward trip; two of these delays entailed a speed restriction of 15 m.p.h., two of 40 m.p.h. and one of 30 m.p.h. In addition, we were brought almost to a stop near Welton, but the driver just managed to avoid coming to a standstill. In spite of these delays, we were only 4 min. 10 sec. late at Rugby, time being gained on schedule for each section of the run. Much the same story could be told of the return trip with the same engine and load, and if a Euston signalman had not seen fit to keep us standing nearly six minutes just outside the station we could have been as much as five minutes or more early.

At Rugby, we saw No. 70005 on the stand; she was artificially loaded to the equivalent of 500 tons behind the tender and running at the equivalent of 25 m.p.h. at 40 per cent. cut-off and with the regulator wide open. This was impressive, to say the least; but after a while the speed was increased to something like 80 m.p.h., though she remained, of course, always in the same place (which was fortunate !). The engine was now a really terrifying spectacle, and to stand within a few inches of the rapidly revolving driving wheels and coupling-rods when they are making something in the region of 380 r.p.m. is an experience which can never be forgotten. And the whole effect is intensely heightened by the terrific noise.

But the information being obtained in the control room, as well as that in the dynamometer car during the outward and inward journeys behind No. 70009, is such as to convince even the most hardened sceptic that the day of the steam locomotive is still far from finished. The "Britannias" are really worthy successors of their famous forerunners.

FUN WITH MINIATURES

by "Scotia"

THE tiny Scotch whisky set shown in the photograph, the composite parts of which are fairly easy to make, is an interesting little piece to complete on the lathe.

While no pretence is made that the idea is original, it is without a doubt an improvement on the shop article, not least of which is a better finish in general.

faction, some attempt should be made to polish it, prior to parting off. One or two grades of old worn emery or crocus cloth, applied in the approved manner, with the lathe at top speed, will usually suffice to produce a surface finish which will respond well to an application of "Brasso" or some of the other well-known metal polishes.

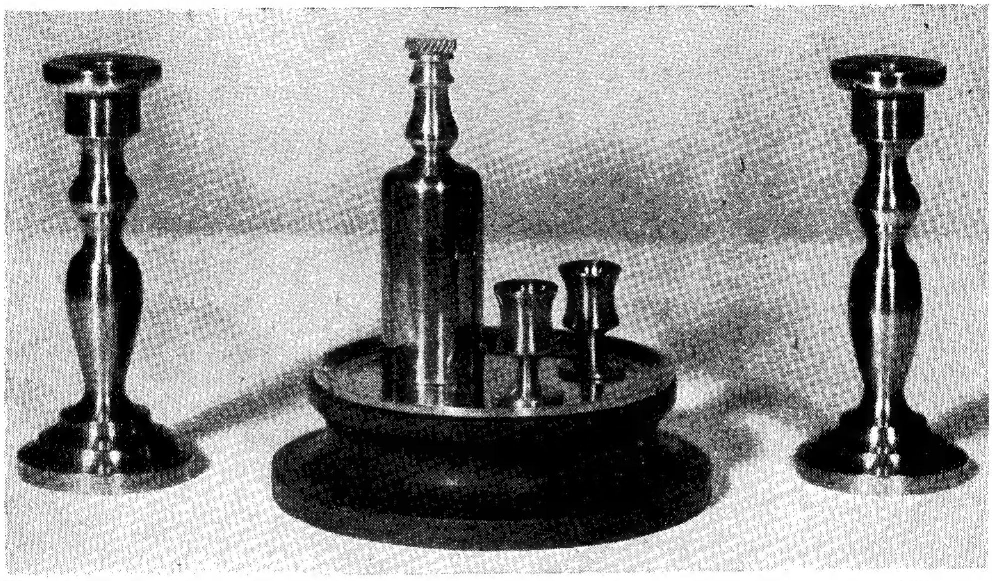


Photo by] [*Wm. Bell*

Miniature whisky set and candlesticks

The little bottle is really bottle-like, too, being hollow in the body and complete with false bottom and stopper.

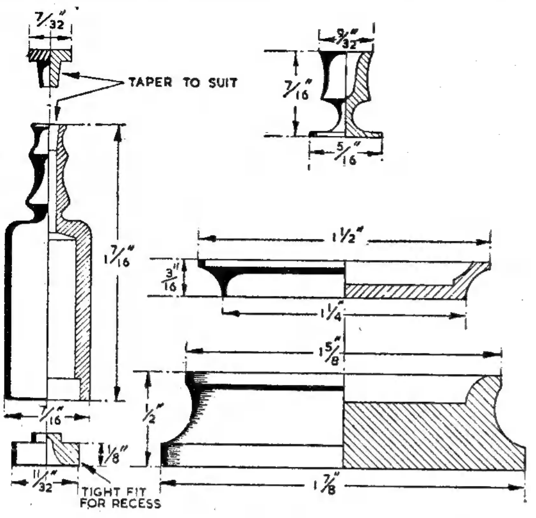
The work involves a fair amount of hand turning, but is quite straightforward, and unlike several of the examples I have described before, contains little in the matter of a "crisis" to worry about. To begin then, the bottle, as seen from the sketch is $\frac{7}{16}$ in. diameter, and therefore, can be made from $\frac{1}{2}$-in. diameter brass rod. Turn to $\frac{7}{16}$ in., drill 9/32 in. to $\frac{7}{8}$ in. deep—drill 3/32 in. diameter hole from there for about $\frac{5}{8}$ in. deep.

Next, a step is formed 11/32 in. diameter by $\frac{1}{8}$ in. deep, to accommodate the bottom portion, which is made separately. Having completed the inside work, attention is given to the outside diameter, and this should be smooth-finished, before proceeding further, for obvious reasons of stability. Rough shaping of the neck portion can be done with a narrow round-nose tool in the post, but hand tools should be used for finishing. When the work is completed to satis-

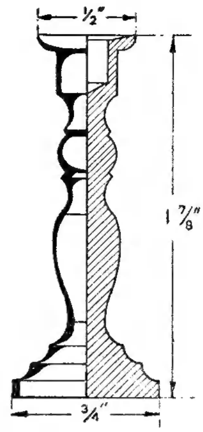
After parting off, the work is held lightly in the three-jaw chuck, smoothed, and rounded off at top. Next, a little tapered reamer or drill is held in the chuck itself, and with the lathe turning at a low speed, the bottle is held to it, in order to form the little taper on the neck for the stopper.

The stopper is easily made from an odd scrap of material, and it is an advantage, after finding the taper, to put a little tick of grinding paste (sand and water does very well) on the point and grind the bottle to it; a rub or two will do. The result is a little stopper which really fits. Before parting off, it can be enhanced by the addition of a little knurled edge, which is easily imparted to it, if you are fortunate to possess a knurling tool. It is wise to run the lathe at a low speed for knurling.

The little false bottom is now turned as per sketch, a small specially ground drill being used to form the cavity. The diameter is left a tight fit for recess on the bottle, and afterwards lightly driven into it, using a piece of wood or some kind



Half sectional elevation of the Scotch whisky set



Half sectional elevation of the miniature candlestick

of mallet, in order to avoid marking. The little bottle is now complete, and if, as sometimes happens, there may be a sharp edge underneath, owing to the bottom part being broader than the step, it can be easily remedied by chucking lightly and rounding off with the hand-tool.

The "glasses" need little explanation. The radius on the bowl should be formed before the stem is shaped. The same drill which was used for the bottom part of bottle does very well in the making of the glasses. After parting off, smooth the underside by rubbing on a piece of emery-cloth.

Using Hand-tools

The little tray is interesting to make, and calls for a piece of brass about $1\frac{1}{2}$ in. minimum dia. The making of the tray affords some scope in the judicious use of hand-tools, and while, as I have already remarked, there is no point likely to arise to defeat an honest attempt, the work itself is interesting and will provide experience for those who care to try their hand at it.

When the tray is complete, the parting tool should be used about half-way through and then withdrawn to allow the work to be well smoothed and polished before finally parting off. Re-grip lightly in self-centring chuck and take a feather cut down the back, adding, if you care to, a couple of members or light grooves near the edge. The base or tray support is entirely optional; my only reason for including it is that I believe it lends distinction to the finished parts. It can be made of ebonite or any kind of wood suitable for turning, and could be stained black for choice.

So much then, for the little whisky set, and the only other remark worthy of mention is that it is advisable, where possible, to use perhaps $\frac{1}{2}$ in. dia. rod for the making of glasses, stopper and bottom in order to avoid the whip which invariably occurs when thin rod is used, a state of affairs which is further aggravated by the use of a chuck which has become bell-mouthed in the jaws.

Methods of Tool Application

When doing work, perhaps of a larger diameter than the examples given in this article, it sometimes happens that it is necessary to rechuck

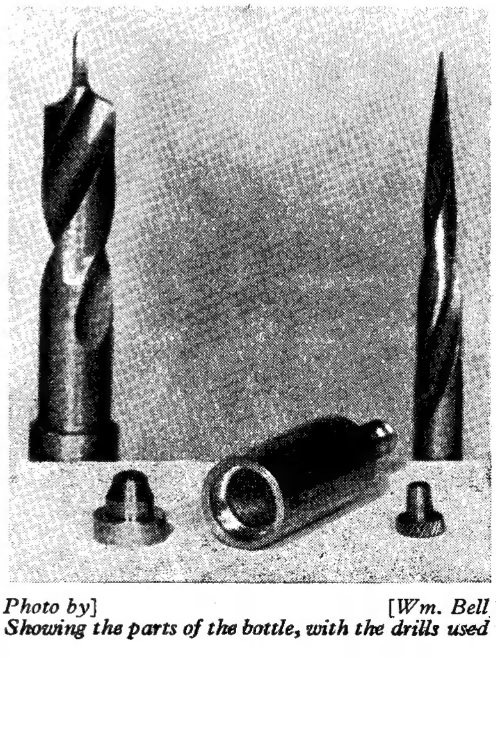


Photo by] *[Wm. Bell*

Showing the parts of the bottle, with the drills used

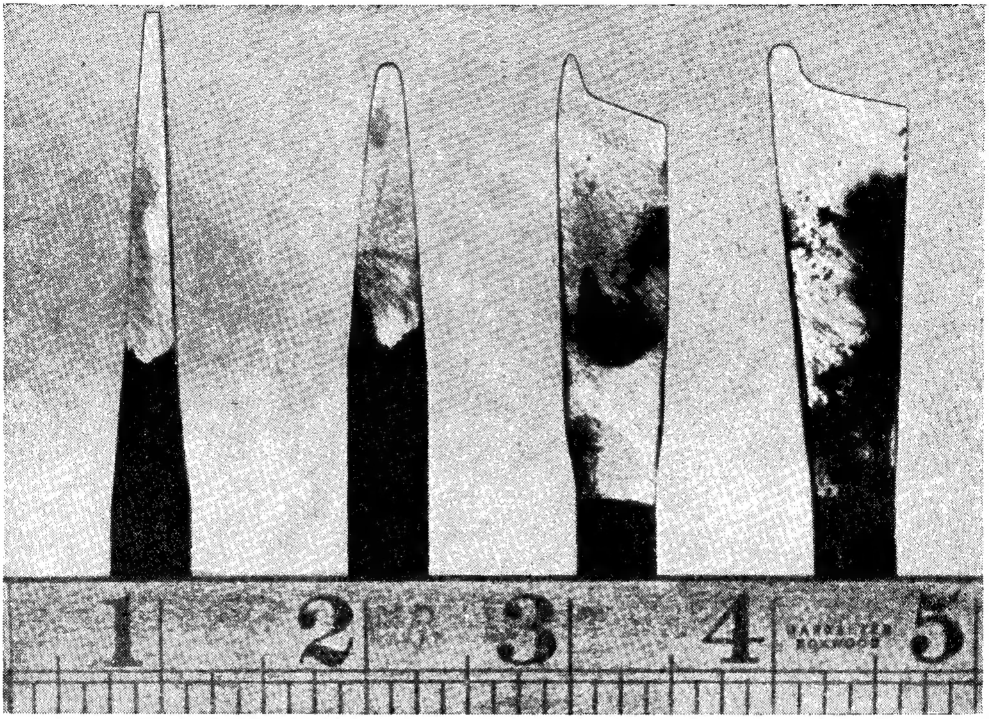


Photo by] [*Wm. Bell*

The hand-turning tools used for the examples shown. In use, the tools are worked forward and lateral directions. The one on extreme left can be used at right-angles to position shown, thus serving as a narrow flat tool

for the purpose of reducing or touching up, or for some other reason. Very often it is difficult to chuck dead true, but usually this fact need present no obstacle. It is possible to hold the hand-tool tangentially to the work, allowing the cutting edge to ride over the surface contour, while at the same time maintaining firm control of the hand-tool in use. Should there be a tendency for fine knurling to occur, which is usually accompanied by a thin high-pitched squeal, this difficulty can be overcome by making contact higher up, this in effect making the angle of contact more acute, and reducing the clearance of the cutting edge. It is this latter circumstance which effects a cure.

Again, should it be desired to true up the work by hand-tooling, this can be easily accomplished in the orthodox manner, by applying the hand-tool at right-angles to the work, with due care exercised on method of application. The tool should be held securely and advanced slowly and firmly to the work, the object being to present a formidable force to the job, and turn it true as required. A thin narrow flat tool is useful for this purpose. Afterwards, form tools can be brought into use again, if required, in order to obtain curvatures which may have been present in the first instance.

These remarks on the rechucking of work are particularly useful in the case of ornamental or figured work, as it is possible to resort to these methods in order to obtain a better finish, or to improve the general design.

A Pair of Tiny Candlesticks

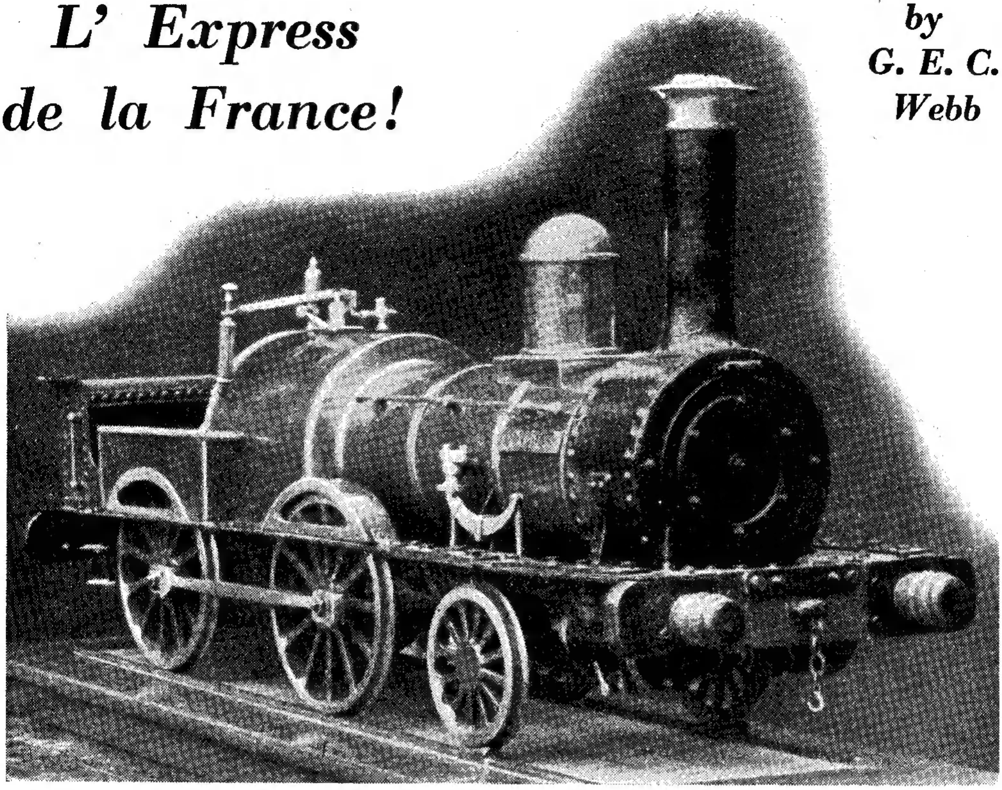
The little candlesticks, as shown, are quite small, and can be made from ⅜ in. diameter rod. Little comment is necessary, as the photograph and sketch explain themselves.

When doing work of this kind, it is wise to finish each little portion of design as far as possible before proceeding to the next part. It will be readily understood that one should always work from the end of the work towards the chuck. The design of the candlestick can be altered, if desired, but the style, as shown, is very graceful. Oddly enough, I always find the second one takes longer to do, owing to the fact that extra time is spent in an attempt to make an exact match with the first one, a feat which isn't always easy, even for one with experience.

The range of hand-turning tools one can draw upon and alter to suit individual requirements affords almost unlimited scope in the field of general design and, in accordance with one's capabilities, boundless possibilities exist in the making of new articles, which can, in some cases, be both ornamental and useful. Nothing pleases the average housewife more than to show some little thing of beauty on the sideboard, which by virtue of its very uncommon-ness is thereby trebled in value in her estimation.

L' Express de la France!

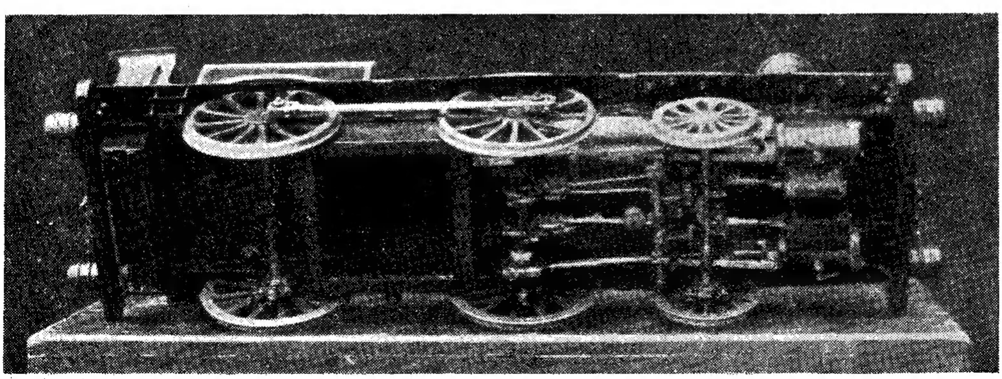
by G. E. C. Webb



LOCOMOTIVES built 80 years ago, especially with solid fuel locomotive-type boilers, must be very rare. When Mr. George Barnes of Southampton heard of such an engine, half buried beneath a heap of rubbish in a junk yard, he lost no time in making enquiries and eventually purchasing it.

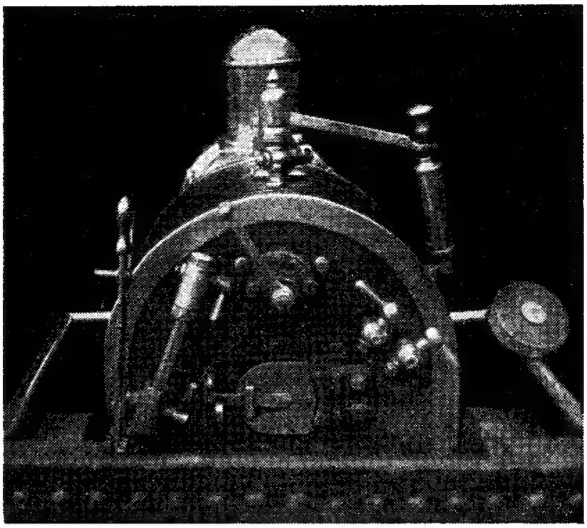
Although the engine was covered with dirt and was somewhat battered, it was obvious at a glance, that she was a genuine antique and a real "find." Mr. Barnes set about making enquiries, in an endeavour to find her origin. Her history, could it be discovered, would no doubt be an interesting story, but unfortunately, he was not able to discover very much. She is believed to have been built in France as long ago as 1870, perhaps even earlier. On each side of her boiler is a brass plate, engraved with the fanciful name "L'EXPRESS," but she is known to the Southampton Society by the much more English name "GALLOPIN' GUS"!

After the outside dirt had been cleaned off,



A view from underneath. Note the thin gauge frames and the large firebox

it was obviously necessary to strip the engine right down and give her a complete overhaul. The pistons, it was discovered, were made from French coins! Each piston was made from two coins, separated by a smaller diameter distance-piece, round which was wrapped a piece of flat steel spring, entirely encircling it. This spring was encircled, in turn, by a brass piston ring, evidently intended to be kept in intimate contact with the cylinder walls by the spring pressure. Mr. Barnes trued up the cast brass cylinders and fitted new pistons, but he kept the old pistons as interesting relics. The "tails" side of one of the coins is outwards on one piston, showing the date on the coin 1853, and the lettering "Napoleon III."



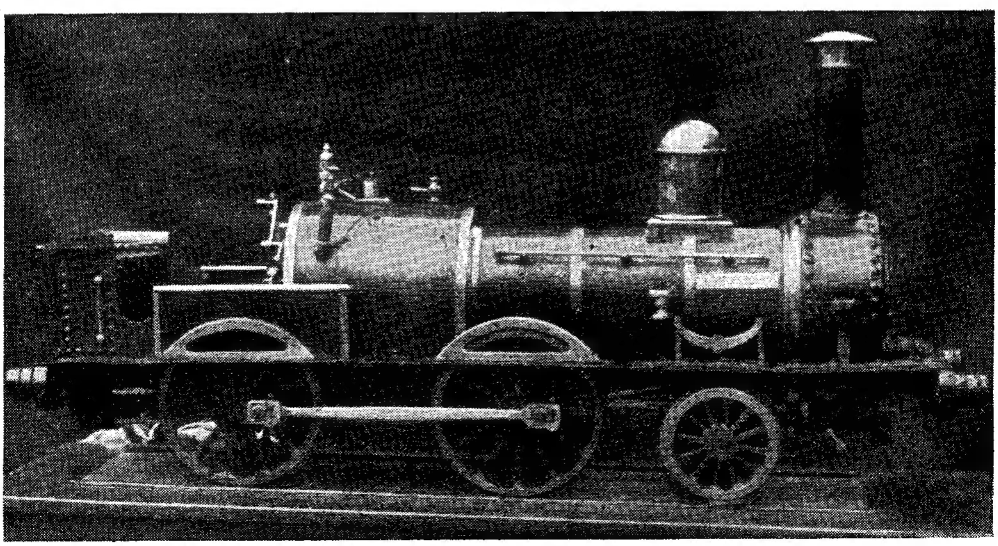
As the driver sees her. One of the original pistons is shown on the right

The engine is $28\frac{1}{2}$ in. long over buffers, and the cylinders are about $1\frac{1}{16}$ in. bore by about $1\frac{1}{4}$ in. stroke. The driving wheels, which are made of brass and have 12 spokes, are $4\frac{13}{16}$ in. diameter, and the brass leading wheels, which also have 12 spokes, are $3\frac{1}{4}$ in. diameter. The driving wheels are spaced at just over 8 in. centres, and the gauge is a little under 6 in. The frames are of very light gauge sheet metal, but all the axles are sprung with wire coil springs. The leaf-spring over the leading wheels, visible in the photographs, is a dummy, made from a solid piece of brass.

The motion work looks rather slender for the size of the engine, and various parts had to be straightened, and generally repaired. The engine has full Stephenson's link motion with the weighshaft underneath, and the lever on the footplate is in a quadrant with five notches, giving full gear and one other position each side of mid-gear. Each cylinder has one drain cock only, right in the middle. It is difficult to see what useful purpose these cocks could have served, for any condensed water in the cylinders would have been trapped in any case, whether the cocks were open or not. And the engine would probably have run just as well with the cocks open as with them shut!

When Mr. Barnes rebored the cylinders, he also fitted new steam and exhaust pipes, and repaired the boiler where it leaked inside the firebox. The whistle was damaged, but this was put right with a touch of silver-solder. The front buffer beam and buffers were missing altogether, but the rear beam was still in place and in good condition, complete with wooden

(*Continued on page* 761)



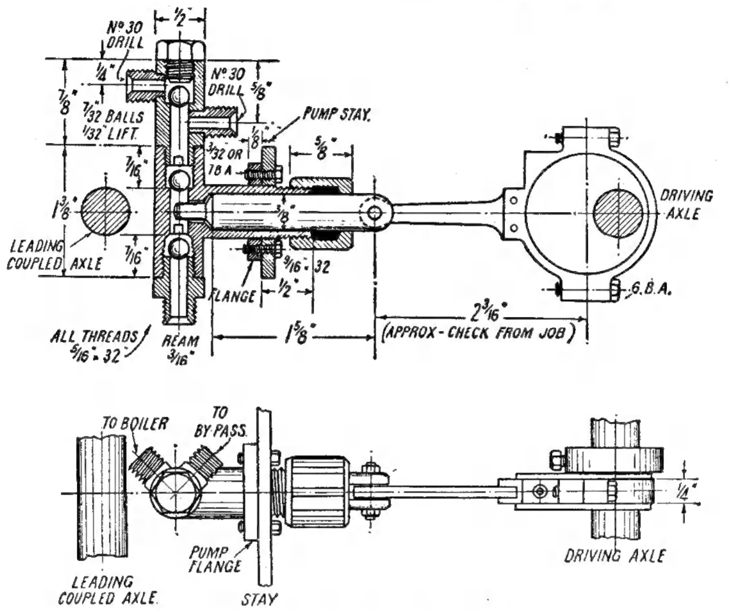
"Britannia" in $3\frac{1}{2}$-in. Gauge

by "L.B.S.C."

THE boiler feed pump on the little lion-and-wheel-brand engine is "a little bit of something that the big one hasn't got," and I only decided on fitting one, after a retired top-link driver let one of my own engines run dry—fortunately without any disaster—through forgetting to put the injector on when running a long non-stop trip. Please your good selves whether you do likewise; the injector I shall specify in due course, all being well, will do the needful, standing or running, without any effect on the steam gauge. However, some folk prefer pumps, and they are good insurance against any happening like that mentioned above; so here are the requisite notes and drawings. It will be seen that the pump is slightly different from those I have hitherto specified, inasmuch as it can be taken out, if ever required, without removing the pump stay, to which it is attached by a square flange on the barrel. It also incorporates a self-contained delivery clack, or top clack, as the enginemen call it, enabling the delivery union to be coupled direct to the boiler top-feed pipe without any auxiliary clack in between. At the time of writing, I don't know if castings will be available; but the whole doings can be made from rod material, so it doesn't matter much.

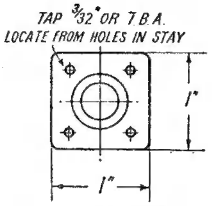
How to Machine the Pump Body

If a casting is available for the pump body and valve box, chuck it by one end of the valve box, holding same in three-jaw, and set the other end to run truly. Face, centre, and drill right through with No. 14 drill. Open out and bottom to $\frac{7}{16}$ in. depth with 9/32 in. drill and D-bit, and tap $\frac{5}{16}$ in. × 32. Slightly countersink the end, and skim off any burr. Chuck any odd scrap of $\frac{1}{2}$-in. rod in three-jaw, face the end, turn down $\frac{1}{4}$ in. length to $\frac{5}{16}$ in. diameter, and screw $\frac{5}{16}$ in. × 32. Screw the tapped end of the valve box on to this, and ditto repeato above operations, except that the D-bit need not be used. Nick the end of the small hole with a tiny chisel made from a bit of silver-steel, and poke a $\frac{3}{16}$-in. parallel reamer through the remnants. This can be done by hand, using a tapwrench on the reamer shank, to save the bother of rechucking truly. Still, if you happen to be a relation of Inspector Meticulous, and won't sleep all night if you don't use the lathe for the reaming job, just chuck the stub mandrel again, centre it, and put a 7/32-in. drill clean through it. Screw one end of the valve box on it, and go right ahead with the reamer in the tailstock chuck; the hole in the stub mandrel will let it pass, and you'll rest with an easy conscience!



Section and plan of pump

There will be a chucking-piece opposite the barrel; grip this in the three-jaw, and set the barrel to run truly. Face the end, centre, and drill down with 7/32-in. drill until it breaks into the reamed hole in the valve box. Let it go well in, so that the drill point touches the other side. Open out to $1\frac{1}{8}$ in. depth with a $\frac{3}{8}$-in. drill. Turn down $\frac{1}{2}$ in. of the end to $\frac{9}{16}$ in. diameter, so that it fits nicely in the hole in the pump stay; screw a full $\frac{3}{8}$ in. of it $\frac{9}{16}$ in. × 32, or any other fine



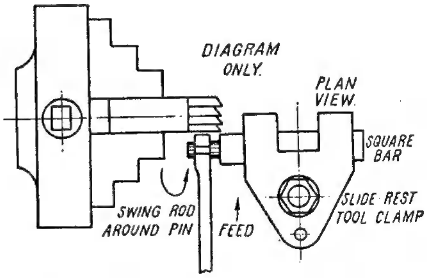
Pump barrel flange

thread for which you may have taps and dies. Finally, face off the square flange, leaving same about $\frac{1}{8}$ in. in thickness. The exact distance between the flange and end of barrel, doesn't matter within 1/32 in. or so. Saw off the chucking-piece, and smooth the stub with a file.

If no castings are available, use a piece of $\frac{1}{2}$-in. round bronze or gunmetal rod for the valve box, $1\frac{3}{8}$ in. long, machining it as above, except that no stub mandrel is required, as it can be turned end-for-end in the chuck, when operating on the second end. The barrel is made from a piece of $\frac{9}{16}$-in. round bronze or gunmetal rod $1\frac{1}{2}$ in. long; the $\frac{3}{8}$-in. drill is put clean through it. One end is faced truly, and screwed for a full $\frac{3}{8}$ in. length with $\frac{9}{16}$ in. × 32 die in tailstock holder. The other end is filed out with a $\frac{1}{2}$-in. round file, to fit snugly against the valve box. Cut a square flange from a piece of $\frac{1}{8}$-in. brass plate; drill a $\frac{9}{16}$-in. hole in the middle, and mount it on the barrel at $\frac{1}{2}$ in. from the screwed end. Tie the barrel to the valve box with a bit of thin iron binding wire, and silver-solder both joints (valve box and flange) at the one heating. Put the $\frac{3}{8}$-in. drill down the barrel, after the job has been cleaned up, and make a countersink on the valve box. Follow up with 7/32-in. drill, letting same touch the opposite side of the reamed hole as mentioned above. The reamer may be put through again, to remove any burrs caused by the drilling. This fabricated caboodle will be just as effective as one made from a casting; and the rest of the assembly will be made in the same way, whichever method of construction has been used.

Valves and Upper Clack

In view of the number of times I have described how to fit pump valves, there is hardly any necessity to go into full detail again; beginners can look up the notes on making the pump for *Tich*. To make the top clack, chuck a piece of $\frac{1}{2}$-in. round bronze rod in three-jaw, face the end, and turn down to $\frac{5}{16}$ in. diameter, a length equal to the distance between the top of the delivery valve ball and the top of the valve box. Take the measurement with a depth gauge. Screw this $\frac{5}{16}$ in. × 32, and part off $\frac{7}{8}$ in. from the shoulder. Reverse in chuck and serve the other end exactly the same as you served the top of the valve box; poke a $\frac{3}{16}$-in. parallel reamer through the small hole at the bottom of the ball chamber. Now watch the next bit carefully; screw the clack, thus far completed, into the top of the valve box, removing the ball whilst this is being done. At $\frac{1}{4}$ in. from the top, make a pop mark at the position the little hand of a clock would be at 10.30; at $\frac{1}{4}$ in. above the shoulder at the bottom, make another, at 1.30; look at the plan view and you'll see what I mean. Drill them out with a 7/32-in. or No. 3 drill, the lower one breaking into the reamed hole, and the upper one breaking into the ball chamber above the seating. Remove the clack, clean off any burrs caused by drilling, and fit a $\frac{5}{16}$ in. × 32 union nipple or screw into each of the holes, so that they stand at right-angles, as shown in plan view. Silver-solder them in, then pickle, wash, and clean up. Take a tiny skim off the spigot at the bottom, so as to give the ball in the pump valve box a lift of approximately 1/32 in., and cross-nick it with a thin flat file, so that the ball doesn't block the entrance to the way out. Fit another ball to the seating in the clackbox, and turn up a cap as shown, from $\frac{7}{16}$-in. hexagon rod, the screwed part being long enough to allow the ball the same amount of lift. Chamfer the end of the screw a little, so that it doesn't obstruct the hole through the union nipple. When the clackbox is screwed tightly into the top of the valve box, the union nipples should be at the positions shown in the plan view of the whole doings. The bottom valve ball is seated in the usual way, on the faced-off end of a double-ended union nipple, as shown in the section; the double-ended nipple is made from $\frac{7}{16}$ in. hexagon rod.



How to machine coupling-rod bosses

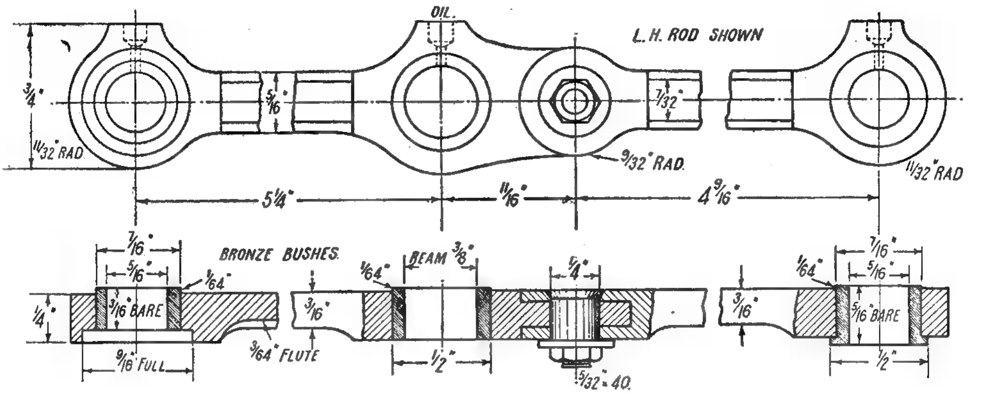
Ram and Gland

If a $2\frac{1}{4}$-in. length of $\frac{3}{8}$-in. ground rustless steel or drawn phosphor-bronze rod is available for the ram, it won't need any turning. It doesn't matter a Continental about the ram of a pump being an Inspector Meticulous fit in the barrel, as long as the gland is O.K. Some pumps, especially crosshead pumps, have an intentional clearance between ram and barrel, like the pump on my L.B. & S.C. Railway engine *Grosvenor*, which has a $\frac{1}{4}$-in. ram in a $\frac{3}{16}$-in. barrel. The valve box is at the gland end of the pump, and the water

has to travel back between [redacted] and barrel, to get out, same [redacted] her big sister's arrangement, and it works champion. Turn down $\frac{5}{16}$ in. of one end to [redacted] full $\frac{3}{16}$ in. diameter, and chamfer it [redacted] the same angle [redacted] the point of the drill used for drilling the pump barrel. Cut [redacted] $\frac{1}{8}$-in. slot, $\frac{7}{16}$ in. deep, in the other end, by the method I have [redacted] often described for slotting valve forks and similar fittings, and drill [redacted] No. 31 cross-hole through it, finishing with a $\frac{1}{8}$-in. reamer.

especially for "jewellery jobs" [redacted] 3-in. does all the ordinary work. Note: I have shown 6-B.A. [redacted] tapped into the "lug" half of the strap, but bolts may, of course, be used by those who prefer them. In that case, drill the lugs No. 41 and make the bolts from 3/32-in. silver-steel, with nuts on each end. They are ever so much stronger than commercial bolts turned from ordinary steel.

The eccentric-rod is filed up from $\frac{1}{8}$-in. flat



Details of coupling-rods

The gland is simply a glorified union nut, and can be made from [redacted] piece of $\frac{3}{4}$-in. round or hexagon bronze rod a full $\frac{5}{8}$ in. long. Don't use soft stuff for this, as it takes the oblique thrust of the eccentric-rod, and poor metal will soon wear oval. I use hard bronze on my own engines, and wear is negligible. Chuck in three-jaw, face, centre, drill through with 23/64-in. drill, open out to $\frac{1}{2}$ in. full depth with 33/64 in. or 13-mm. drill, and tap $\frac{9}{16}$ in. × 32. Put a $\frac{3}{8}$-in. parallel reamer through the remains of the smaller hole. Chamfer both ends; and if round rod has been used, cut six or eight C-spanner slots in it. If [redacted] miller, planer or shaper isn't available (I use my planer with [redacted] parting-tool in the clapper-box for jobs like this—it's quick!) judicious use of a hacksaw will do the needful, or [redacted] watchmaker's flat file can be used.

Eccentric Strap and Rod

No need to dilate at length on these, either, but may I remind all and sundry, to drill the screw or bolt holes through the lugs *before* sawing the casting across, and mark the lug on one side, so that the halves can be put together same way every time. Use the top of vice jaws for guide when sawing across. Screw both halves together, chuck in four-jaw with core-hole running [redacted] truly as possible, bore to [redacted] running fit on the eccentric—use [redacted] bit of rod same size [redacted] eccentric, for [redacted] gauge; it is better than calipers—and face one side. The other side can be faced truly, either by mounting on [redacted] stub-mandrel in three-jaw, or mounting on the bottom step of the inside jaws of the chuck itself, if they close small enough. I have [redacted] dinky 2-in. three-jaw on my Boley lathe, which I keep

steel to shape shown, and riveted and soldered into a slot cut in the lug to accommodate it. Leave the eye end full length until the pump is erected. The easiest way to do this job in the first place, is to take out the pump stay, poke the end of the pump barrel through the hole, so that the flange is hard up against the stay, and clamp it temporarily, making sure the valve box is vertical in relation to the stay. Then locate, drill, and tap the holes in the flange, same as described for cylinder covers; put the screws in, and replace the lot, with the pump ram right home in the barrel. Put the eccentric strap on, and drop the rod in the slot in the ram. With a bent scriber, make [redacted] mark on the end through the cross-hole in the end of the ram. Remove rod, make a pop mark 1/32 in nearer the strap, than is indicated by the scriber mark; drill [redacted] No. 31 hole and ream it $\frac{1}{8}$ in. Round off the end of the eye to suit, and pin it with a pin made from $\frac{1}{8}$-in. round silver-steel, reduced to 3/32 in. at both ends, screwed 3/32 in. or 7 B.A., and furnished with ordinary commercial nuts. To prevent undue wear, the eye may be case-hardened or bushed, as you wish. To case-harden, make the eye redhot, roll in "Kasenit," "Pearlite," or any good case-hardening powder, filling up the hole. Reheat until the yellow flame dies away, and the powder has fused; quench in clean cold water, and clean up. To bush, simply drill out the eye with [redacted] $\frac{3}{16}$-in. drill, and squeeze in [redacted] bush made from bronze rod. Ream $\frac{1}{8}$ in. after the bush has been squeezed home and filed flush both sides. The gland may be packed with a few strands unravelled from [redacted] bit of full-size hydraulic pump packing, or graphited yarn may be used. Don't screw up the gland too tightly.

Coupling-rods

The coupling-rods [redacted] made from plain honest-to-goodness mild-steel bar, of $\frac{3}{8}$ in. × $\frac{1}{4}$ in. section [redacted] plain straightforward job of milling, or sawing and filing. In the latter case, much of the superfluous metal could first be removed by turning, as fully described for *Tich.* All dimensions are given in the illustrations. The way I do mine is to mark out, on two suitable lengths of bar, the outlines of the two halves, and drill [redacted] $\frac{3}{16}$-in. hole in each boss. Similar holes are drilled in two other pieces of bar, using the first as a jig, and then the bits are temporarily fixed together with pieces of $\frac{3}{16}$-in. rod driven into the holes. Each pair of bars is then mounted in the machine-vice on my milling machine; and [redacted] $1\frac{1}{2}$-in. slabbing cutter on the arbor, soon removes all the surplus metal between the bosses, and forms the front recesses. A 7/32 in. × 3 in. saw-type cutter puts the flutes in. The holes in the bosses are then opened to $\frac{1}{4}$ in. A bit of $\frac{1}{2}$ in. square steel with [redacted] $\frac{1}{4}$-in. pip turned on the end, is then placed in the machine-vice on my vertical milling machine, the boss of one of the rods slipped over it, and run up to the side of a $\frac{5}{16}$-in. end-mill in the vertical spindle. The outer end of the rod is then slowly and steadily swung around by hand—this needs [redacted] strong and steady wrist!—and the end-mill cuts [redacted] beautifully clean circular boss. I take care not to swing the ends of the rods far enough round to cut off the oil boxes.

The slotted ends of the shorter halves are formed in the same way as the slots in valve-gear forks and similar parts, whilst the tongue on the rear end of the longer rod is formed by pin-drilling both sides evenly, until a tongue is formed which exactly fits the slot. The knuckle-pin is turned from $\frac{3}{8}$-in. round mild-steel, to the shape shown in the illustration; the outer end is reduced to 5/32 in., screwed 5/32 in. × 40, and furnished with [redacted] nut and washer. The nut has to be home-made from $\frac{1}{4}$-in. hexagon rod, or you could tap out [redacted] $\frac{1}{8}$-in. commercial nut. The front boss is recessed with a pin-drill, also home-made (see *Tich* instructions if you don't know how to make one) the end bosses [redacted] opened out to $\frac{7}{16}$ in., and the middle one to $\frac{1}{2}$ in. Turning and squeezing in the bushes, is just [redacted] kiddy's practice job; so is drilling the oil holes indicated by dotted lines. Nos. 30 and 55 drills are used for these. A little judicious trimming with [redacted] file, to smooth out any places where the straight and curved surfaces haven't been properly "merged" with the milling cutters, completes the job.

If no milling machine is available, the superfluous metal may be sawn and filed away, using the vice top as a guide for the hacksaw. It isn't such [redacted] heartbreaking and arm-aching job [redacted] would appear at first sight (I did enough of them that way, goodness only knows, before I had my present equipment) if [redacted] good make of saw-blade is used, anything between 14 and 22 teeth per inch, and plenty of cutting oil applied to the blade. The bosses may be rounded by filing; or the before-mentioned bit of rod with [redacted] pip at the end, mounted under the slide-rest tool-holder, parallel with lathe bed, the end-mill being held in three-jaw. This virtually constitutes [redacted] vertical miller turned on its side. A little care in swinging the free end of the rod, slow speed, and plenty of cutting oil, will produce machined bosses in the lathe as well as any vertical miller. The flutes may be put in by gripping the rods under the slide-rest tool holder, setting them at centre height, and traversing across a 7/32-in. end-mill held in three-jaw. This will, of course, leave rounded ends to the flutes; but some full-sized rods are finished thus, and the ends are hardly noticeable. Final warning: if you used [redacted] pair of dummy rods for your wheel quartering, use them as jigs to mark out the proper rods, or else check your rod centres from the axle centres. Then, if a slight mistake has been made in spacing the axleboxes, it won't make any difference, as the rods will be made to suit. I'll have [redacted] word to say on erecting the rods in [redacted] coming instalment.

L' Express de la France!

(*Continued from page* 757)

buffers. A new front buffer beam was made from wood, together with buffers, etc., to match the rear one. The safety-valve was also put in order and the boiler re-lagged. The engine has been exhibited several times, and unfortunately the safety-valve has been damaged again.

The boiler was clearly intended to burn solid fuel, for when the engine came into Mr. Barnes' possession, she had [redacted] proper grate with firebars. The old grate has since been removed and made into a domestic trivet.

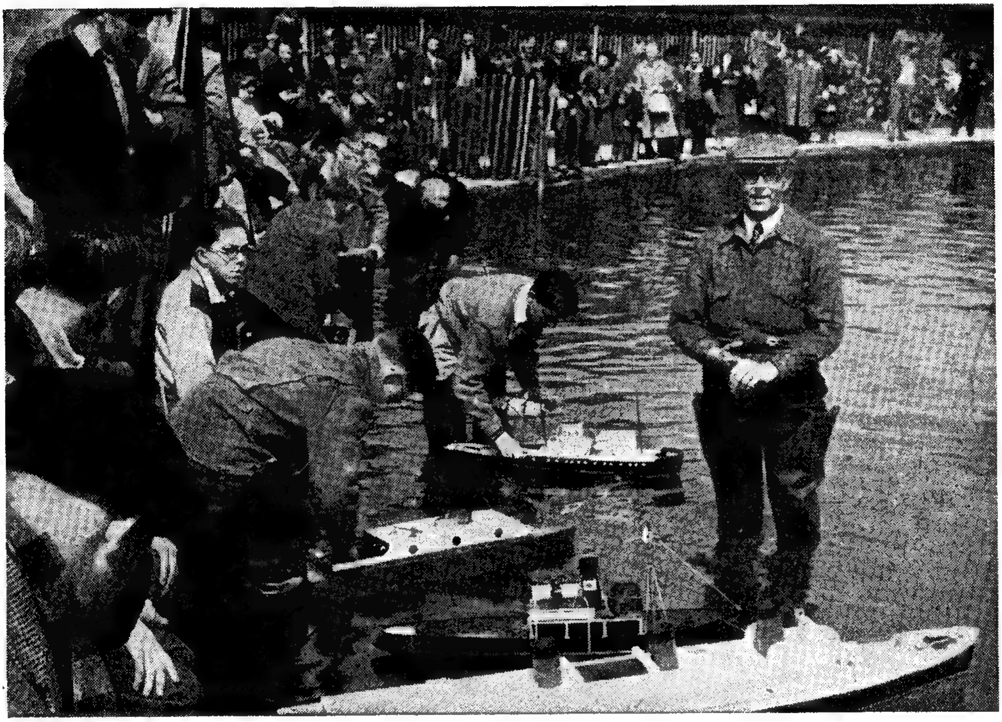
The smokebox has a neatly made door with the hinge at the top, so that it opens upwards, and is fastened by the usual crossbar inside. There is no blast pipe, the two exhaust pipes each running up into the base of the chimney. The firebox is quite cavernous, measuring $4\frac{1}{4}$ in. square inside; but there are no tubes, one large flue only running through the boiler. Mr. Barnes *has* steamed the engine—just to make sure that the wheels really would go round. With [redacted] wad of cotton wool soaked in methylated spirit to provide the fire, the boiler easily maintained 30 lb. pressure while spinning the wheels merrily, with the engine propped up with the wheels free. How she would perform on a track could not be found out, [redacted] Mr. Barnes—not unnaturally—knew of no line laid to the odd gauge needed.

Now she has been re-painted in dark red, carefully matched as nearly [redacted] possible to her original colour. It is unlikely that she will ever be steamed again, but she remains [redacted] interesting relic of days gone by.

THE BOURNVILLE REGATTA

A REMARKABLE demonstration of the popularity of model power boats was given recently, on the occasion of the annual regatta of the Bournville Club.

The attendance of competitors far exceeded that of former regattas, and no less than fifteen different clubs were represented, including five from the London area.



The regatta was declared open by Sir Robert Bird who, accompanied by Lady Bird, remained throughout the day watching the various events.

The proceedings started with [illegible] Steering Competition for the free-running craft and this event attracted some 30 boats.

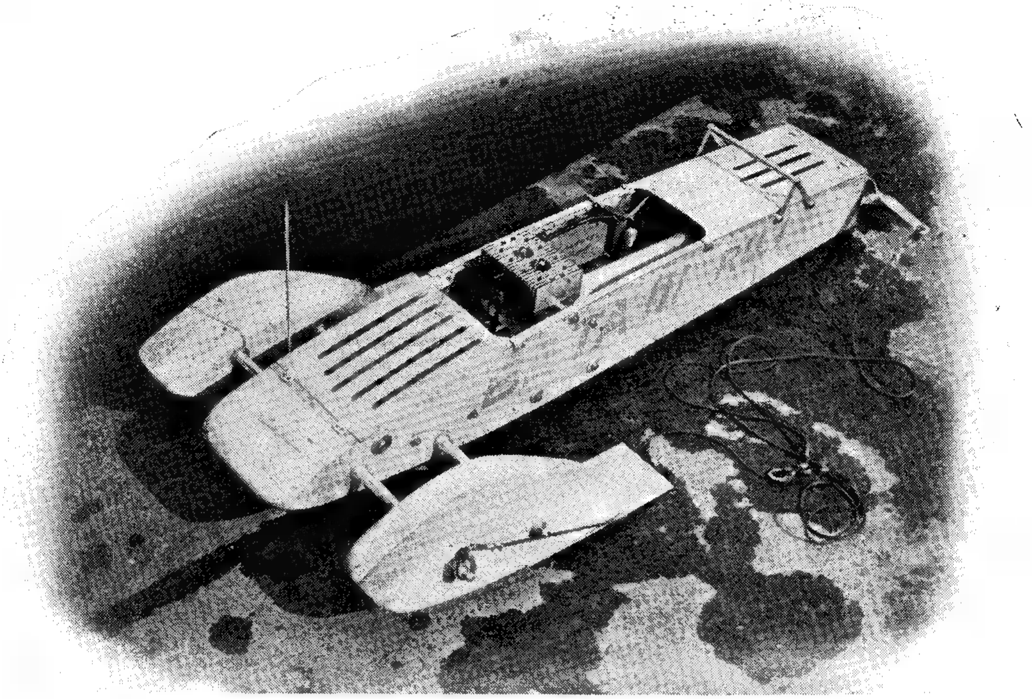
The course was a long one, and [illegible] cross-wind was blowing, so that no spectacular scores were made, nevertheless an interesting contest to watch. Hardly a boat scored on all three runs and, eventually, two Bournville boats C. Williams's *Seahawk* and P. Wakeman's *Yvonne* had tied with 5 pts. each—one bull and one inner, while about six other boats had scored 4 pts. On the re-run to decide the winner, both the Bournville boats missed completely, but on another attempt C. Williams scored [illegible] outer, while P. Wakeman missed again.

The lunch break had intervened half-way through the Steering Competition, and consequently the speed events started somewhat later than anticipated. There [illegible] a total of 33 entries in the various classes. Among these were the record holders in the " A " and " B " classes respectively. Messrs. K. Williams *Faro*, G. Lines *Sparky II*, and R. Phillips was running *Foz II*, the successor to *Foz*. The first racing event was [illegible] 5-lap race for the Class " C " hydroplanes, and some ten boats contested this, the Derby Club being well represented among these.

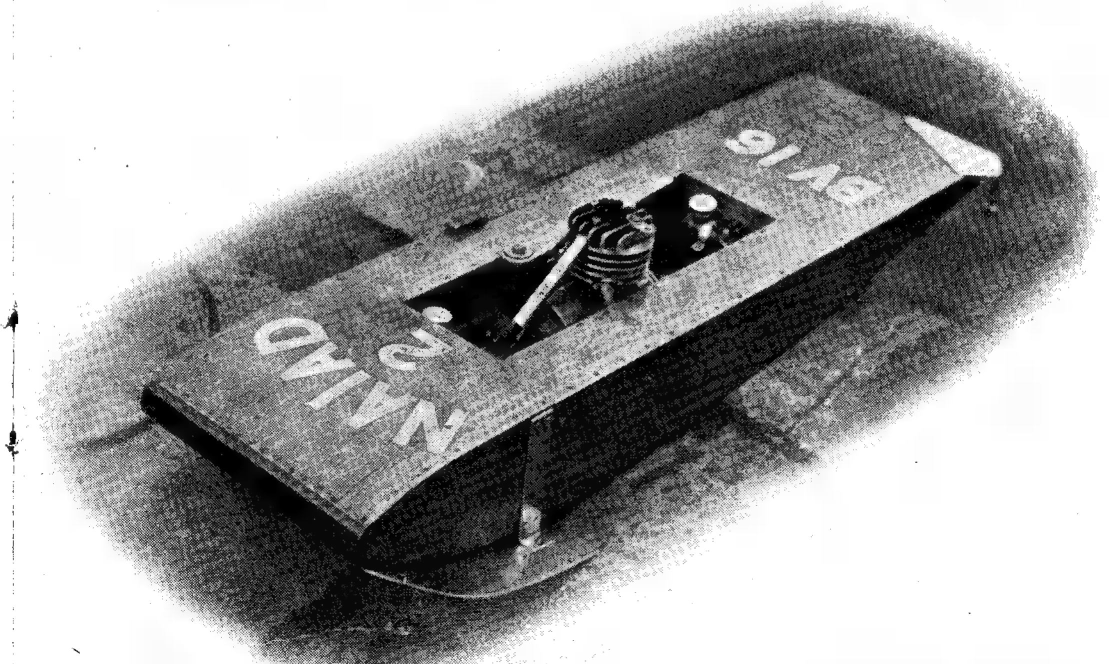
D. Innes (Altringham) with *Jo-Mac* was the winner of this race at a speed of 46.6 m.p.h., very closely followed by R. Phillips with *Foz II* 46.4 m.p.h. An interesting fact about *Jo-Mac* is that Mr. Innes uses Pool petrol with spark ignition !

R. Mitchel (Runcorn) put in two nice runs with the " split single " *Gamma*, both at about 42 m.p.h. E. Clare (Derby) had no luck with *Imshi* now fitted with [illegible] home-built engine, but this was the first try-out with the new engine and adjustments were obviously needed.

The 500 yd. Class " B " race which followed provided much interest, as it became a two-stroke versus four-stroke duel ; the contestants being R. Mitchell, *Beta II* and G. Lines, *Sparky II*. R. Mitchell also ran a striking new boat, having [illegible] 15 c.c. " split-single " similar to *Gamma*. This boat, however, suffered from teething troubles and capsized on both attempts, in spite of [illegible] hacksaw work on the metal planes, put in between [illegible] !



Mr. Mitchell's new 15-c.c. hydroplane "Beta III," with "split-single" engine and twin propellers



Mr. T. Dalziel's 15-c.c. hydroplane "Naiad 2," distinguished for its unusual "tail-up" planing attitude

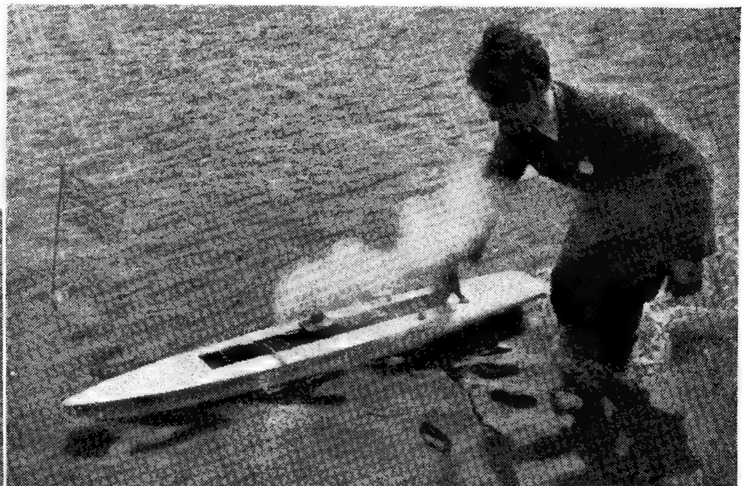
Although the weather conditions appeared reasonable for speed craft, and the "C" Class boats had appeared quite stable, most of the competitors were troubled with instability during this race.

G. Lines (Orpington) with *Sparky II* capsized on the first run and on [redacted] second try completed the five laps at 44.1 m.p.h. R. Mitchell (Runcorn) with the four-stroke engined *Beta II* exactly equalled this speed, and on [redacted] further [redacted] made by two Altrincham boats, by Messrs. F. Westmoreland and R. Tompkinson.

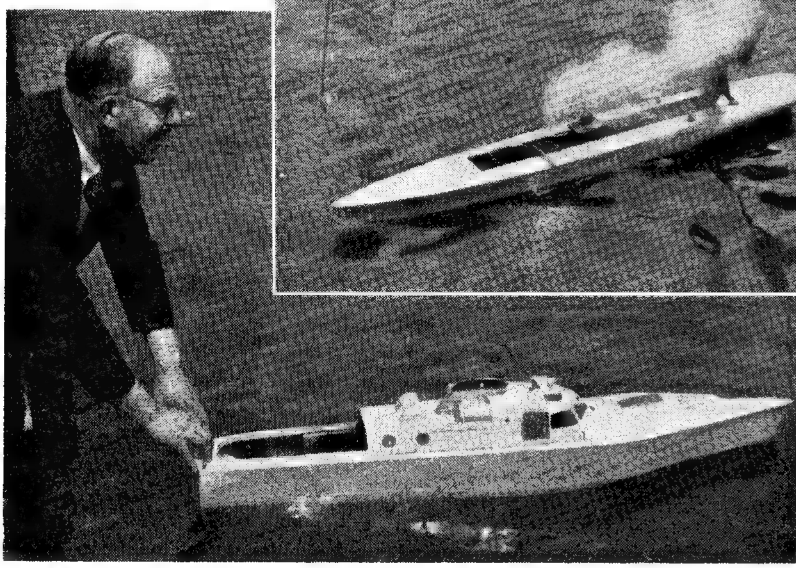
Results

Steering Competition for the A. Hackforth Steering Trophy.

1. C. Williams (Bournville), *Seahawk* : 5 pts. +0+1.
2. P. Wakeman (Bourneville), *Yvonne* : 5 pts. +0+0.



Above—One of the home club entries in the steering competition



Below—Mr. Curtis (Kingsmere) with "Karango"

run to decide the winner *Sparky II* capsized, while *Beta II* recorded about 42 m.p.h. A. Churcher (Coventry) managed to complete one run with *Annete*, but T. Dalziel (Bournville) could not get *Naiad* away properly.

The "C" Restricted boats were next, and here speeds were lower than the previous events. Of the five "D" class boats entered, only one completed the course, and the best two runs were put up by boats from the home club; R. Pratt's *Dopey* and P. Wakeman's *Blue Blazes* taking first and second places at 36.2 and 33 m.p.h. respectively.

The final event in which eight competitors [redacted] forthcoming was the Class "A" race for the "Coronation Speed Trophy," and this proved to be [redacted] victory for flash steam. A. Cockman's *Ifit 7* did 52.3 m.p.h. on the first run, and the other competitors could not do better although *Faro* speeded up considerably after the timed laps had been completed. J. Innocent's *Betty* took second place at 45.1 m.p.h. and other clear

500 *yd. Class "C" Race.*

1. D. Innes (Altrincham), *Jo-Mac* : 46.6 m.p.h.
2. R. Phillips (S. London), *Foz II* : 46.4 m.p.h.
3. R. Mitchell (Runcorn), *Gamma* : 42.1 m.p.h.

500 *yd. Class "B" Race for the O. W. Collier Trophy.*

1. R. Mitchell (Runcorn), *Beta II* : 44.1 m.p.h., re-run 42.3 m.p.h.
2. G. Lines (Orpington), *Sparky II* : 44.1 m.p.h., re-run —.

500 *yd. "C" Restricted Race.*

1. A. Pratt (Bournville), *Dopey* : 36.2 m.p.h.
2. P. Wakeman (Bournville), *Blue Blazes* : 33.0 m.p.h.

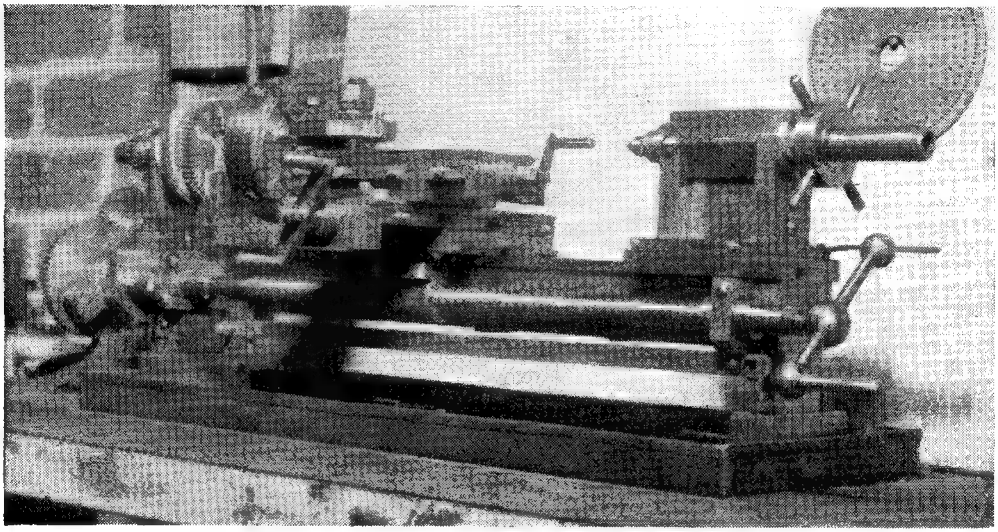
500 *yd. Class "A" Race for the Coronation Speed Trophy.*

1. A. Cockman (Victoria), *Ifit 7* : 52.3 m.p.h.
2. J. Innocent (Victoria), *Betty* : 45.1 m.p.h.
3. K. Williams (Bourneville), *Faro* : 40.7 m.p.h.

A Hand-Made Lathe

by W. A. Clifford

BEFORE describing the lathe which forms the subject of this article, let me say at once that the design is not entirely of my inventing. Apart from some modifications for which I am responsible, the idea was hatched in the fertile brain of Mr. C. H. Devanter, and here, if I may



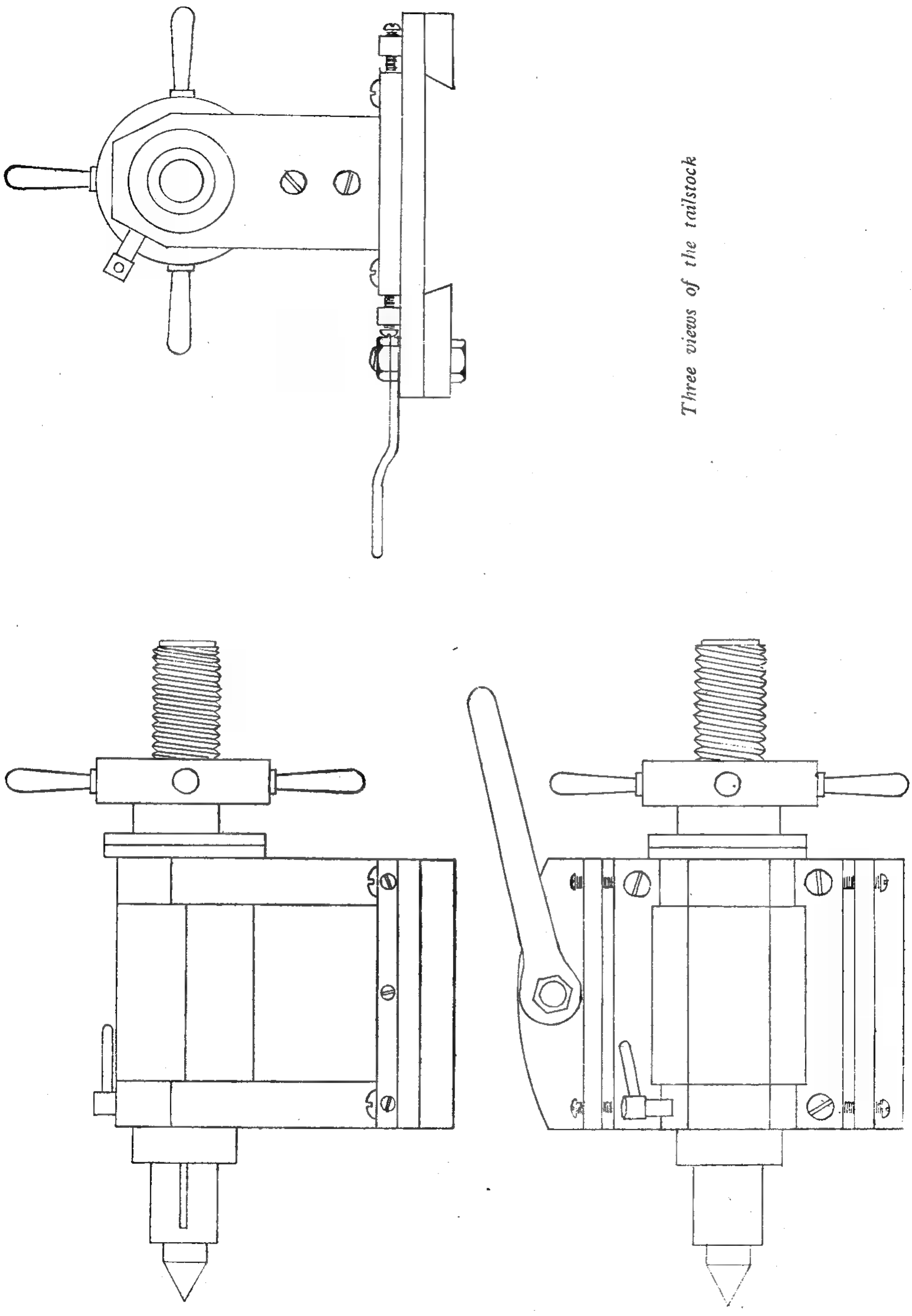
steal a line, I would like to make my grateful acknowledgments to him, both for his permitting publication of the design, and for his generous help in the past. I believe that he made several of these lathes of various sizes, and it was the one which he kept for personal use that inspired me to make the one to be described.

The reader will have gathered by the title that it is a fruit of hard work. Only such tools as may be usually found in the average handyman's workshop were used: for example—hacksaw, files, vice, etc. All the holes were drilled with a small wheelbrace (one-and-sixpence pre-war) and a carpenter's brace, the latter dealing with drills too large for the eighteen-penny article. An accurate square and a finely graduated rule, were, of course, indispensable items. So much for the tools, now for the materials.

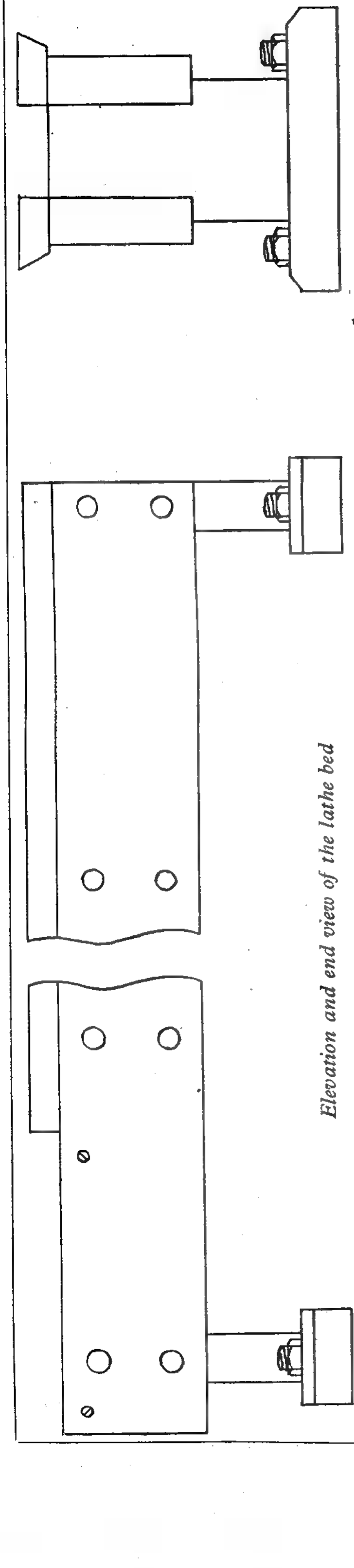
Mild-steel, mainly bright drawn, constitutes the tool; in fact, it is the only ferrous metal used apart from the mandrel, which had its origin in a discarded half shaft taken from a very ancient car. The bearings and bushes throughout are phosphor-bronze. The back gears, in common with the change wheels, are in hard brass, and the teeth were filed by hand. To smother the groans of those fortunates who posses gear-cutting apparatus, I can only say that the wheels do perform their allotted functions though not quite, perhaps, in that dignified silence which marks the cast of a precision-cut effort.

The fourth metal employed is that of which the cone pulley is made, and there must always be some doubt as to its exact composition, as it is the product resulting from melting down anything that looked like aluminium. It contains a discarded motor-cycle number-plate, some small fittings once attached to some surgical instruments, and a few oddments found in that good old source of supply, the junk box. I seem to have, too, a dim recollection of one or two domestic utensils that mysteriously disappeared when it was found that scrap was running low. I must mention that this "brew" was concocted in the top half of a steel helmet, the rim and part of the crown having been cut off. This crude crucible or ladle, as it had now become, after having a handle affixed, was placed over the dining-room fire, and with complete disregard of sundry mutterings about fuel rationing and being blown up one of these days, the scrap was reduced to a soup-like consistency, and poured into a mould.

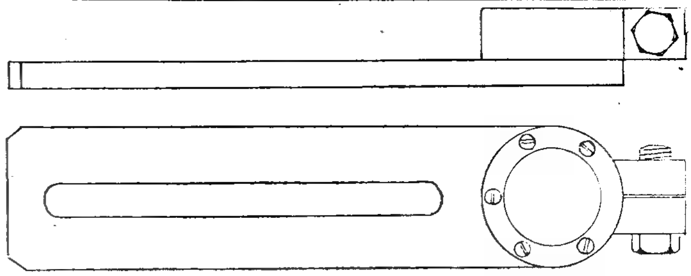
Now, having exposed myself to the scorn and derision of those who know all there is to know about gear cutting, I decline to describe that mould, lest I suffer at the hands of the foundry men. Sufficient to say, that from it there emerged a weird, unearthly shape, so horrible, that for a moment, I took fright at the hideous thing; but after steeling myself to make another inspection, I recognised the bronze bush, which I had



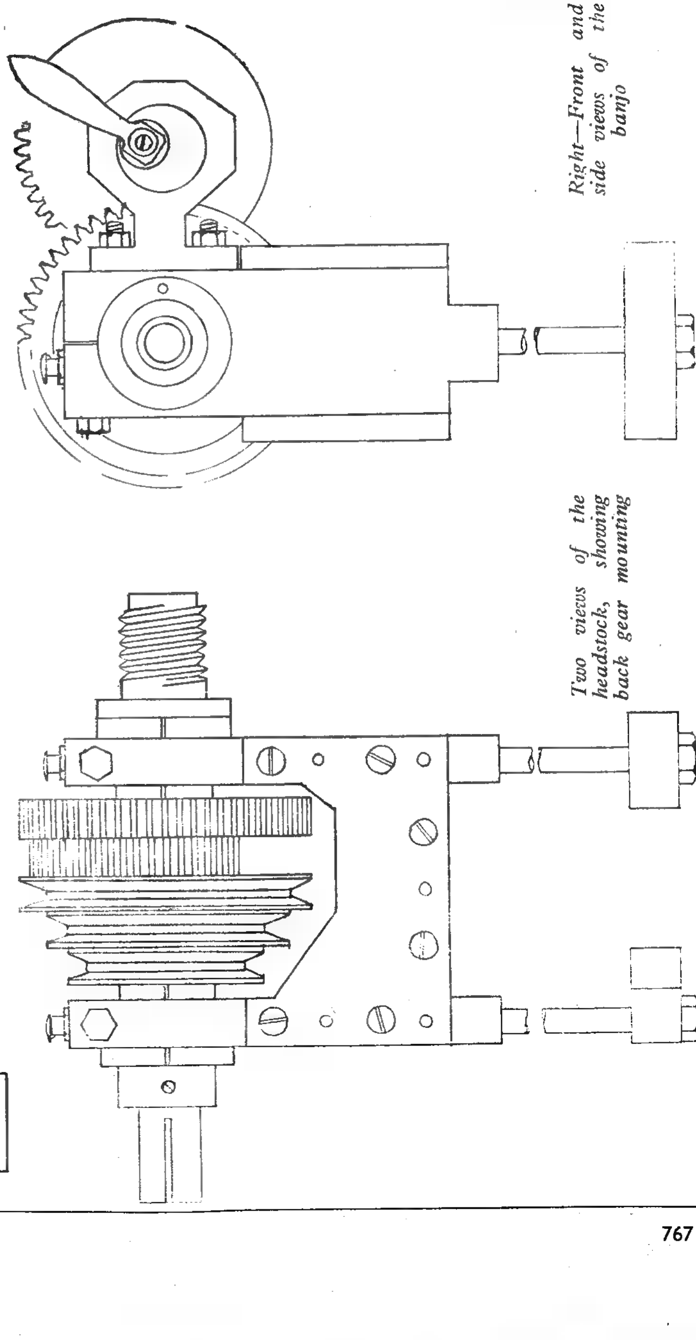
Three views of the tailstock



Elevation and end view of the lathe bed



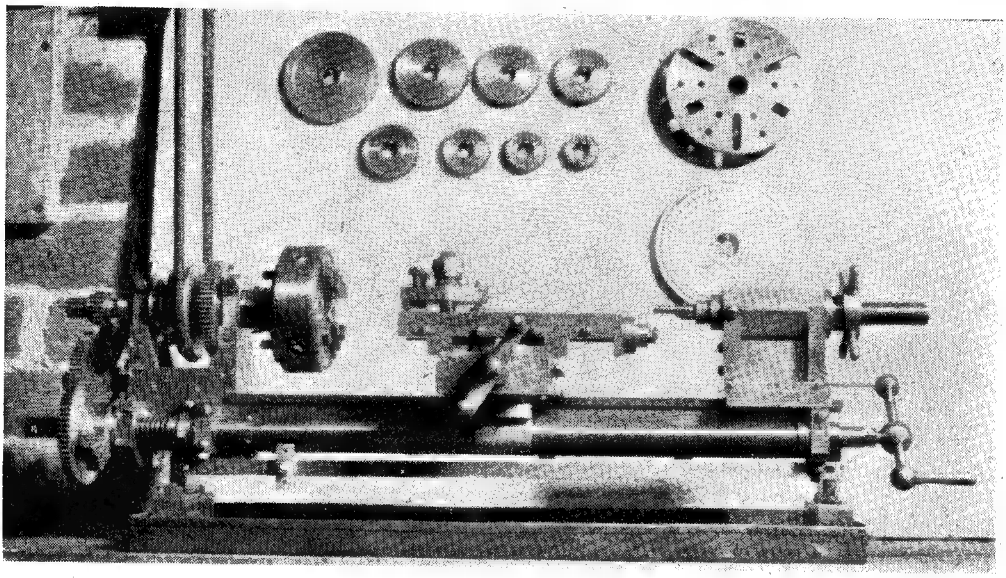
Right—Front and side views of the banjo



Two views of the headstock, showing back gear mounting

thoughtfully inserted in the mould before pouring the metal, and it seemed [redacted] firmly embedded in the surrounding conglomeration that it looked like [redacted] day's labour to get it out again. So, without [redacted] delay, I took it to the now partly completed lathe and thereon tortured it into its present shape. In order to do this, [redacted] temporary wooden pulley was used.

Despite its appearance upon emergence from the mould, it proved to be [redacted] sound casting; not [redacted] flaw in it, and it machined beautifully. After prolonged use it shows no sign of wear.



The lathe is of 2⅝ in. centre height and has a bed 21 in. long, taking nearly 13 in. between centres. It is backgeared, screwcutting, and has a fully compound rest with swivelling top-slide. There is a total of 16 wheels (with the back gears) and the teeth were all filed by hand. I think its chief merit lies in the fact that it is made from easily obtainable materials and could be constructed by anyone possessing sufficient patience.

It will be seen by the photographs, that it is quite a sturdy tool, and I was surprised at the heavy cut that can be taken on this home-made contraption.

I have not stated any dimensions on the drawings and this is because I assume that anyone desirous of constructing such a lathe would use materials as might be obtainable, and cut the suit according [redacted] the cloth, so to speak. Such was my method. The drawings are, however, reproduced half full size.

The first part of the lathe to be made was the bed, and this [redacted] constructed in B.D.M.S. The main bearers, of 1½ in. × ½ in. section, were cut, drilled and tapped where necessary, and the legs and distance-pieces then fitted. The vees, which form the guides for the saddle and tailstock, [redacted] bright drawn strip with the angle filed on one edge. These strips [redacted] fastened down to the bed with countersunk bolts, the heads of which were left slightly projecting and then filed flush. At alternate spacings to the bolts, silver-steel pins were inserted, these being a tight drive fit in the bed and riveted into a slight countersink in the vee-strips. After being cleaned up and made [redacted] true as possible, the joint was almost invisible and even under the heaviest cut has shown no sign of giving.

By the time the bed was complete, the headstock plates and mandrel bearings had been bored. These, together with the mandrel, were produced by the designer and good friends mentioned above, and, incidentally, represent the whole of the machine tool work that was done, apart from the leadscrew, other than on the lathe itself. Once the headstock was fitted to the bed, a four-jaw chuck was attached, and a treadle rigged up. After that, the rest of the lathe grew on itself, so to speak.

The next components tackled were the saddle and compound rest. These were all built up from mild-steel, and they provided [redacted] tricky lesson in fitting in order to obtain the parallelism and the smooth sliding action required. Gib-strips were fitted and are adjusted by small set-screws and nuts. The top-slide swivels by virtue of semi-circular slots cut in its carriage. The feed screws for both top and bottom slides are standard Whitworth 20 threads. As such threads are so easily renewed, it was not considered necessary to bother with square threads [redacted] again, it is possible, by judicious use of the die, to cut a really tight thread and thereby eliminate backlash to a great extent. Another obvious advantage, lies in the fact that the number of threads (20) makes it [redacted] easy matter to divide up for the micrometer dials.

(To be continued)

*Flexible Shaft Equipment

and Construction of a Drilling Hand-Piece

by Robert Cutler

THE drilling hand-piece is based on the "Eclipse" chuck-type pin vice, No. 3 size, and although the makers (James Neill Sheffield Ltd.) state that it is not suitable as a drilling chuck, it is perhaps a testimony to the excellent workmanship of this little tool that, if carefully prepared, it forms a suitable chuck spindle for the hand-piece to be described. The No. 3 size chosen has a nominal chuck capacity of 0.05 to 0.125 in., i.e., handling drills from Nos. 54 to 30, this including the standard shank dental drills or "burrs," of which more anon. Fig. 8 and Fig. 9 (top) shows the No. 3 model chosen, the chuck jaws (*A*) being a separate split shell insert with hardened jaws, the chuck cap (*B*), main barrel (*C*) and shaft (*D*) are knurled, the latter being hollow and just passing a No. 17 drill. The first step is to take a No. 17 or No. 18 drill and to clean out the hollow shaft right up to the chuck jaws, using the drill reamer-wise, and a length of ground silver-steel rod is then chosen to make a gentle push fit: this is primarily to form the extension drive spigot, but will also form a recessed stop for the end of the chucked drill shank, greatly aiding its accurate centralisation, as the chuck cap is tightened. A 6 in. length of silver-steel rod of the appropriate size is truly chucked, centre drilled and drilled 3/32 in. diameter, $\frac{1}{8}$ in. deep; it can be lightly countersunk by the centre drill to aid centralisation of drills larger than 3/32 in. This is then

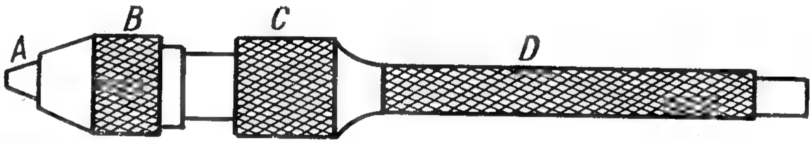


Fig. 8. Eclipse No. 3 chuck-type pin vice to approximate. ("A") Hardened jaws permanent shell insert. ("B") Knurled chuck cap. ("C") Knurled main body. ("D") Knurled hollow shaft

*Continued from page 731, "M.E.," June 7, 1951.

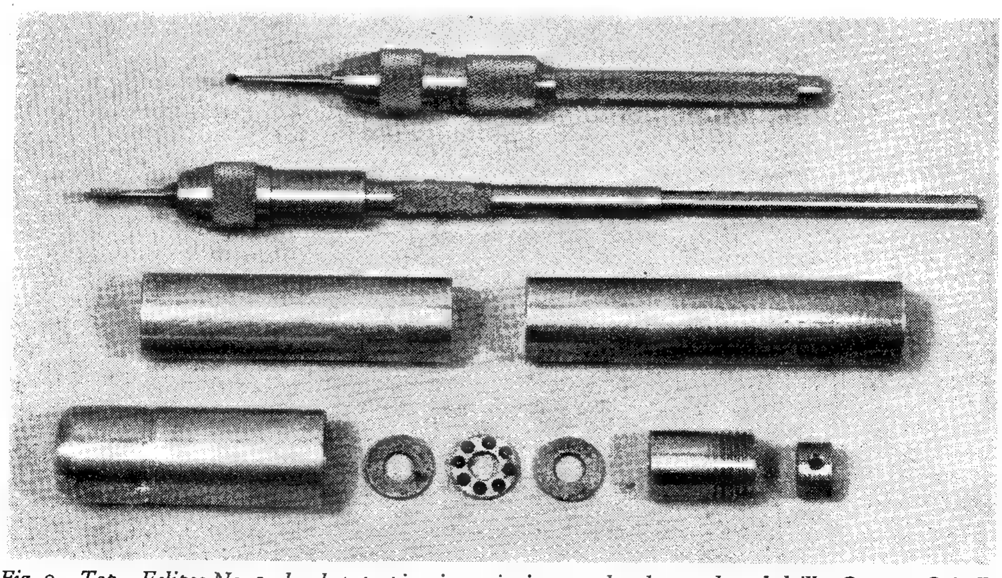


Fig. 9. Top—Eclipse No. 3 chuck-type pin vice, gripping rose head-type dental drill. Centre—Spindle fully machined with extension driving spigot pinned in position. Lower centre—Left, nose-piece casing; Right, extension casing. (Main bearing bush pressed in front of nose-piece) Bottom—Left to right. Chuck cover hood, case-hardened washers and brass cage of thrust-race, rear bearing, and terminal securing collar

laid aside for the moment. A piece of ⅛ in. diameter silver-steel is now gripped firmly in the little chuck with about 1 in. projecting, and this projecting shank is then gripped truly in the lathe headstock three-jaw chuck; the hollow end of the knurled shaft is then engaged in the tailstock centre, and the whole assembly should be found to run truly. A light skimming cut is now taken over the main barrel to reduce it

and inserting a 3/32-in. drill: it should run truly and be tightly gripped (Fig. 9, middle).

Hand-piece Body. A length of ⅝ in. external diameter heavy gauge brass or steel tube is taken and tested for reasonable truth ; one end is faced in the three-jaw and a 2¼ in. length parted off. The internal diameter will be found to be about ½ in. and a 31/64 in. or ½-in. drill or reamer can be used to clean up the bore;

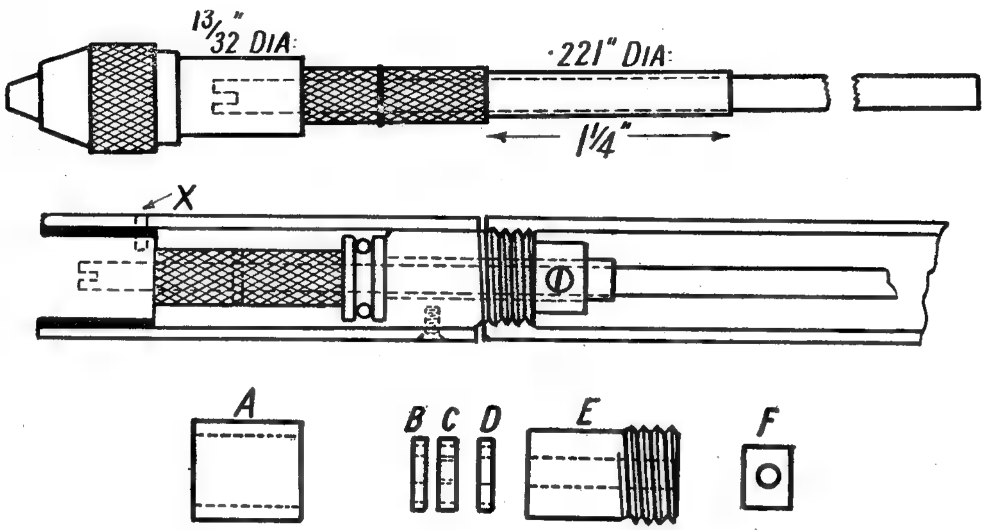


Fig. 10. Spindle machined with silver-steel rod insert, recessed at front, pinned in position. General arrangement of nose-piece, showing bushes, thrust-race assembly securing collar and tommy bar hole, ("X"). ("A")—Front bush; ("B")—Front thrust washer; ("C")—Ball cage; ("D")—Rear thrust washer; ("E")—Rear bush threaded ¼-in. B.S.P.; ("F")—Terminal securing collar with set-screws, ⅛-in. Whit. (Approximate scale)

to 13/32 in. diameter and the terminal 1¼ in. of the shaft reduced to 0.221 in. diameter (No. 2 drill). The writer made a test hole with a No. 2 drill in a piece of brass bar, and used this as a gauge to secure a running fit, the self-same drill being used in the later preparation of the rear bearing: the main barrel diameter can be similarly gauged with a brass bar drilled 13/32 in. diameter, the same drill being reserved for preparation of the front bearing. The assembly is then taken down, and the prepared silver-steel shaft is gently tapped in, recessed end first, until a 3/32 in. drill shank, lightly gripped in the little chuck can be passed down to a length of 1¼ in., taking care to see it seats in the recess (this length is chosen to suit a standard dental drill, but it will be very suitable for the shanks of all drills in the Nos. 54-30 range.) It is again emphasised that this seating of the drill shank greatly aids its true running, and care should be taken with this procedure. The rod is then pinned in the shaft by drilling right through the remaining knurled part of the shank, $\frac{1}{16}$ in. diameter, and lightly riveting a short piece of $\frac{1}{16}$ in. diameter silver-steel. The drilling spindle is now complete and can be tested by gripping the skimmed barrel in the three-jaw chuck, cap outward,

one end is now bored $\frac{9}{16}$ in. deep to 17/32 in. diameter, and then reversed, the other end being then cleaned out 1 in. deep with the boring tool, as little material as possible being removed. The nose, or main bearing, bush is now made by chucking a length of phosphor-bronze and reducing to an accurate interference fit with the bored-out nose; it is pilot drilled and enlarged to 13/32 in. with the drill used for making the gauge previously referred to, and parted off $\frac{9}{16}$ in. long. It is pressed in the nose and reamed if necessary, checking the running fit of the spindle in it. Alternatively, it can be parted off solid, pressed in and then drilled *in situ*. For the rear bearing, another length of phosphor-bronze is chucked, and reduced to 17/32 in. diameter, and then threaded ¼ in. B.S.P. for ¼ in.: a further ½ in. is then reduced to make a light push fit in the cleaned-out bore of the unbushed end of the main tube, it is pilot drilled and enlarged to No. 2 size drill, with drill previously used in making the gauge block, and parted off.

The thrust-race assembly and terminal securing-collar are then made, some ball-bearings being secured. (The balls actually used by the writer were 0.095 in. diameter, and this is near the permissible maximum; smaller balls could

be used equally well). The thrust washers [redacted] turned 15/32 in. diameter, one being drilled No. 2 drill centre hole for butting snugly against the shoulder of the shaft, the other is drilled No. [redacted] size for easy clearance, this being for the rear bearing face end of the assembly. The cage is brass 15/32 in. diameter, No. 1 size drill centre hole, of appropriate clearance thickness for the balls selected, and eight holes drilled equidistantly for the balls : [redacted] light line can be turned with [redacted] pointed tool on the face of the brass before parting off, equidistant between inner and outer diameter to aid marking-out for the ball holes, which should be of appropriate size to give

use, [redacted] miniature tommy bar has to be used to lock the spindle whilst the chuck cap is tightened.

The nose-piece is centre-popped at 15/32 in. from the front end and drilled 3/32 in. diameter, sufficiently deep to enter the main spindle ; the total depth should not much exceed $\frac{3}{16}$ in., and if [redacted] sensitive drill is used, pressure should be lifted as soon as the drill is felt to be biting into the hard silver-steel rod core. All chips should be removed ; this tommy bar hole will also function as an oiling point in subsequent use. A 2 in. length of 3/32 in. silver-steel is prepared as [redacted] miniature tommy bar and case-hardened.

The only two remaining tasks are the body

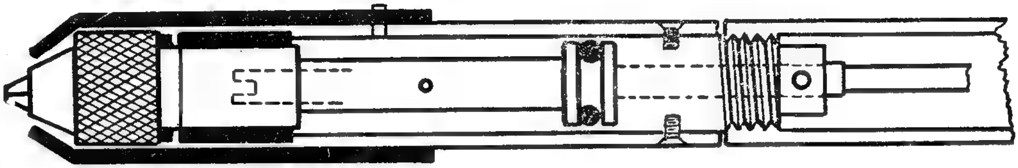


Fig. 11. *General arrangement, showing removable chuck cap hood and disposition of items composing the rear thrust-bearing and terminal securing collar.* (*Not to scale*)

running clearance to the balls. The thrust washers are honed flat and case-hardened.

The terminal securing collar is mild-steel turned $\frac{7}{16}$ in. diameter, $\frac{1}{4}$ in. long, bored No. 2 drill and drilled transversely $\frac{1}{8}$ in. Whit. tapping drill, which is then tapped for two small $\frac{1}{8}$-in. Whit. securing set-screws (Fig. 9, bottom). The nose-piece is now ready for assembly, the front and rear bearings having been checked independently for running fit on the main chuck spindle. The chuck spindle, with nose cap fully tightened, is now inserted, a clearance of at least $\frac{1}{16}$ in. being allowed between recessed shoulder of chuck cap and face of the bushed nose-piece body, this being secured by [redacted] cardboard washer which can be later cut away. The rear end of the body is then held upwards and the thrust washer with No. 2 drill size hole pushed down to seat snugly on the shoulder of the shaft, the ball cage loaded with grease, with balls imbedded, is then pushed down followed by the second thrust washer No. [redacted] size drill centre hole. The rear bearing is then pushed gently down until home against the thrust washer, the main spindle not having been disturbed : opposed pilot holes are then drilled through the casing over the inserted rear bearing bush to register on the bush within, and this is then gently withdrawn, drilled 6 B.A. tapping drill and threaded, the casing holes are enlarged to 6 B.A. clearance and countersunk ; the bush is reinserted and fixed with countersunk-head 6-B.A. set-screws, short enough to clear the bore. The terminal collar is now pushed on and the cardboard spacer under the chuck cap cut away, any slack in the thrust bearing is taken up, and the terminal collar secured by the set-screws.

A final operation, and a fairly delicate one, is making [redacted] tommy bar hole through bush and casing in the front end of the nose-piece, to be continued into the main body of the spindle, as in

extension to screw on the main nose-piece assembly and the chuck cover hood : the former consists of another length of the $\frac{5}{8}$ in. tube similar to that used for the nosepiece ; it is chucked and faced, and the bore lightly cleaned out, after which it is tapped $\frac{1}{2}$ in. B.S.P. using [redacted] tailstock tapping fitment : [redacted] full thread may not be possible but sufficient depth will be secured. The length is optional, about $2\frac{3}{4}$ in. being convenient and it can be parted off accordingly. It can be screwed on the nose-piece and the whole polished, the end being adapted for the flexible shaft casing connection, whilst the internal silver-steel driving spigot is likewise adapted to the driving cable. The chuck hood consists of a length not exceeding 2 in. of light gauge tubing, having [redacted] gentle push fit over the nose-piece, or if this is not available heavier tubing can be turned down as thin as possible and bored to fit.

A thin tapered nose shell with internal contour to suit the chuck cap is turned, spun, or pressed separately of thin material and soldered on the hood tube, this having a central aperture of $\frac{3}{8}$ in. diameter. It is slipped over the nosepiece, until it is just clear of the nose of the chuck when the largest size drill is gripped, and [redacted] register hole drilled through hood and nose-piece body about $1\frac{1}{4}$ in. from front face of nose-piece : [redacted] short stud is screwed into the body (say $\frac{1}{8}$ in. Whit.) and the hood slotted and profiled for a single bayonet cap attachment. This hood is slipped on and locked by rotation after the drill is secured in the chuck and so covers all moving parts and allows the fingers to assume the "guard position" for fine drilling or profiling : it cannot be used if large grinding wheels are employed, as it cannot be slipped over, but for such work and similar heavy work, it would be usual for the hand-piece to be held in the overlapping grip, and so would not be required.

Final mention should now be made of the

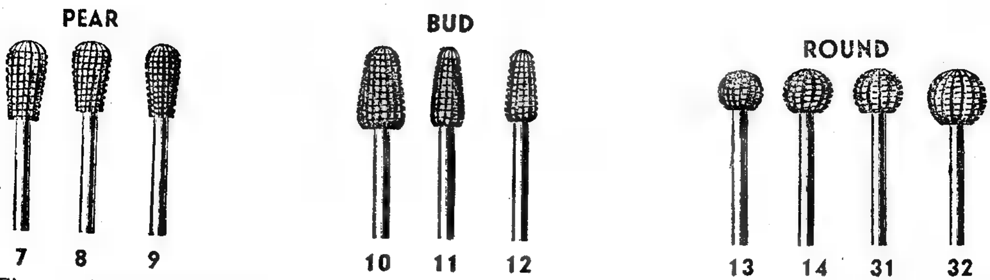


Fig. 12. Large burs or rifflers with standard dental drill shank for bulk removal of wood or plastic. Standard dental drills are not cross-cut and are available in sizes No. ½ to No. 10. (Courtesy of the Amalgamated Dental Co.)

dental drills or burs used by the dental surgeon, the "straight hand-piece" type recommended being standardised with a length of 2¼ in. and shank diameter 3/32 in. The cutting heads are of various shapes, "rosehead" for drilling, "fissure" for milling and profiling, and "inverted cone" for undercutting, and are sold in packets of six (all one size) in sizes ranging from what is known as "No. ½" to "No. 10," Nos. 4 to [illegible] being most useful. Although they cannot be sharpened, they have a long life for any material other than hard steel. For model work they are simple invaluable, and any reader having a dentist friend could probably secure some used ones for the asking, as they have to be discarded very rapidly by the dentist once the razor sharpness has gone, as appreciable drilling pressure on the teeth themselves is strictly inadmissable. Small standard shank mandrels with fixed or removable circular stones up to ⅜ in. diameter are also obtainable, likewise thin slitting saws for wood, plastic and soft metals, whilst large diameter head rifflers or rotary file burs are sold, this being useful for bulk free-hand removal of wood or plastic (Fig. 12).

Model makers of the pen-knife and sandpaper type may well feel the use of the shaft hand-piece to be "cheating," and in open competition the dentist competitor might well have a twinge of conscience in the matter, but the writer feels his own conscience is sufficiently calmed by his description of this easily made fitment, so making its advantages available to all.

Materials and Suppliers

Chuck Type Pin Vice. Eclipse No. 3. (James Neill & Co.) Any tool shop.

Motors. Fractional Horse Power Motors, Colindale. "Fracmo," Frame 250 capacitor type, 1/30 h.p., 2,800 r.p.m., double-ended ball-bearing shaft. Mail Order Supply Co., D. R. Welch & Co.: converted rotary transformers.

Flexible Shafts. Aero-Spares. Ball-bearing shaft, with low-voltage motor attached if required; Coley, Grange Road, Kingston. Speedometer and tachometer drives; S. S. White Company, 126, Great Portland Street, W.1. Precision shafting; Amalgamated Dental Co., Head Office, Broadwick Street, W.1. Complete shafts.

Dental Drills, Burs and Stones. Amalgamated Dental Co.

Phosphor-bronze Rod. P. Wilkinson & Sons Ltd., 14, Tottenham Mews, W.1.

Solid-drawn Brass Tube. Farmers, Fulham Road, S.W.

Ground Silver-steel Rod. Tool shops, or Gamages, boxed in sizes from 1/16 in. to ½ in. diameter.

Spring-loaded Plunger Switches, Type S.99, for Foot Switch Conversions. Milligan's, 24, Harford Street, Liverpool, 3.

Myford Progress

We are informed by the Myford Engineering Co. Ltd., of Beeston, Notts., that their lathes have been selected by the Council of Industrial Design for exhibition at the Festival of Britain, and they will also be shown at the first European Machine Tools Exhibition at Paris, in September. The enormous demand for Myford products has kept the factory working to full capacity, and the equipment has been improved and augmented, recent additions including B.S.A. bar and chucking automatics, B.S.A.-Landis universal grinding machines, and Drummond Maxicut gear shapers. The M.L.7 lathe has been improved in detail by the provision of nipples to all lubrication points previously fitted with ball-type oilers, thus enabling them to be lubricated under pressure from an oil gun, which has now been added to the standard equipment of each lathe.

Myford products are available in Canada through the Company's branch office at 1, West Avenue South, Hamilton, Ontario, in the charge of Mr. S. Jackson. On the Eastern seaboard, Novia Scotia, New Brunswick and Prince Edward Island, they are distributed by Messrs. E. S. Stephenson & Co. Ltd., of St. John, N.B., and they are also available on the western side from the many branches of Messrs. T. Easton & Co. Ltd., Vancouver, British Columbia.

IN THE WORKSHOP

by "Duplex"

No. 91*—A Die-Holder with Detachable Guides

BEFORE starting to machine the castings, it is advisable to free them from adherent scale and sand by immersion in an acid bath. For this purpose, commercial hydrochloric acid, commonly known as spirits of salts, will be found suitable, as it is quick-acting and costs little; a mixture is made in the proportion of [illegible] oz. of acid to about [illegible] pint of water.

An hour's treatment in the acid should suffice to clean the castings. As mentioned in the previous article, tungsten carbide tipped tools will retain their sharpness much longer than other kinds of lathe tools and, in addition, they will be but little affected by any sand left after the pickling process.

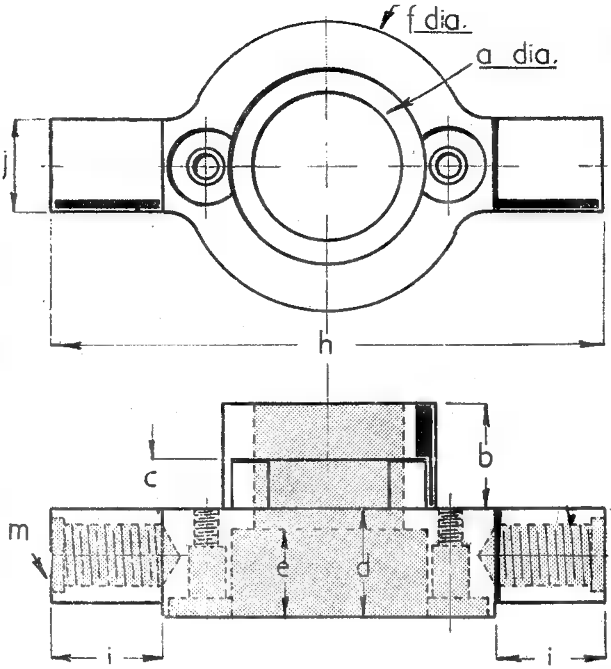


Fig. 8

Machining the Body

The finished dimensions of this part are indicated by letters in the working drawings in Figs. 8 and 9; these letters refer to the figures given in the accompanying Table, Fig. 10. It will be seen that this Table, as well as others that follow, has the dimensions set out in three horizontal lines: *A*, *B*, and *C*; these refer to die-holders for use with $\frac{13}{16}$ in., 1 in., and $1\frac{1}{16}$ in. dies respectively, and this scheme will be adhered to throughout. The lugs into which the handles will later be screwed are cast approximately parallel; this is to enable the work to be gripped in the self-centring chuck. However, to ensure a firm grip, a light cut is first taken over the lug,

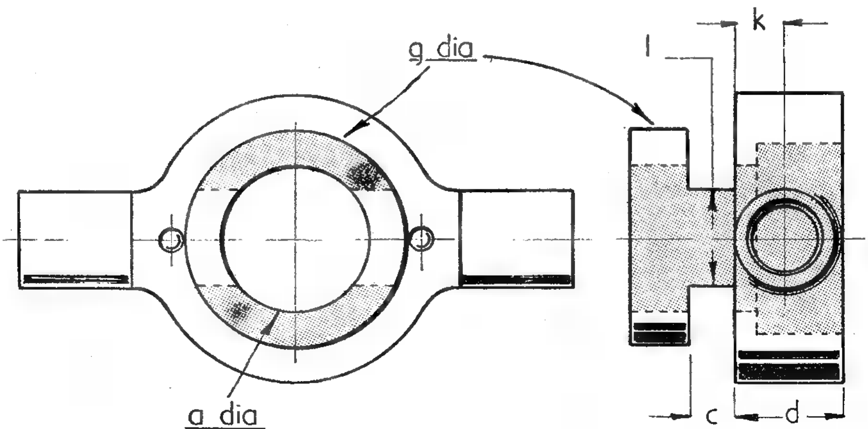


Fig. 9

*Continued from page 709, "M.E.," May 31, 1951.

	a	b	c	d	e	f	g	h	i	j	k	l	m
A	1/2"	7/16"	3/16"	13/32"	5/16"	1 1/4"	13/16"	2 1/4"	7/16"	13/32"	13/64"	13/32"	1/4" BSF
B	3/4"	9/16"	1/4"	9/16"	15/32"	1 1/2"	1 1/8"	2 3/4"	9/16"	15/32"	15/64"	15/32"	5/16" BSF
C	7/8"	13/16"	3/8"	5/8"	17/32"	1 7/8"	1 5/16"	3 3/4"	3/4"	5/8"	9/32"	9/16"	7/16" x 26T

Fig. 10

shown in Fig. 11, and the casting is then reversed in the chuck so that the other lug can also be turned parallel. In this way, the two lugs can be turned to the finished size and length, and also made equal in diameter.

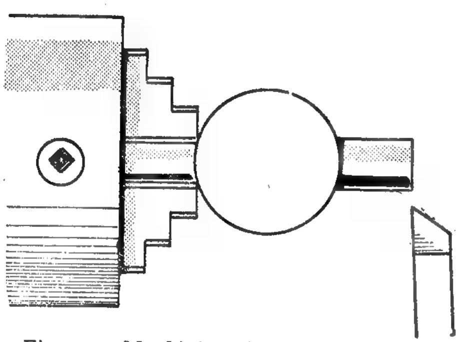


Fig. 11. *Machining the body lugs*

As represented in Fig. 12, the next step is to machine the lower part of the casting in which the collet will be mounted. This is done by gripping the work in the four-jaw chuck and setting the boss to run as nearly true as possible with the aid of the test indicator; at the same time, the test indicator is applied to the machined surface of the two lugs to make sure that the work is set squarely in the chuck. The boss can now be machined with a knife tool to the finished diameter and length.

If the boss is next gripped in the self-centring chuck as shown in Fig. 13, the two lugs will be automatically centred and will lie squarely across the lathe axis; but if the casting is mounted in the four-jaw chuck, the outer faces of the two lugs must be set to run truly by again using the test indicator. This set-up enables the surface of the die housing to be faced, but the machining should be kept just clear of the two lugs. Next, the casting is bored right through to the collet diameter, and the outer portion of the bore is then enlarged to form the recess to take the die.

When determining the exact diameter of the die housing, it is advisable to measure the whole set of dies with the micrometer so that the bore will allow the largest die to fit in place.

The next operation is to bore and tap the lugs to receive the two steel handles. As represented in Fig. 14, the casting is gripped by one of its lugs in the self-centring or four-jaw chuck, and the operations of drilling, boring, and tapping are carried out in the order shown.

To obtain an accurate and truly aligned bore, it is best to enlarge the preliminary drill hole with a small boring tool, for the ordinary form of twist drill is apt to wander when machining bronze. The outer end of the bore should be counter-bored so that the threads will be concealed when the handles are screwed into place. The larger sizes of die-holders, when gripped in the chuck by one of the lugs, project rather too far from the chuck for the tapping operation to be easily carried out, and it is better, therefore, to start the tap squarely in the lathe and to finish the tapping at the bench. To check the squareness of the tap in the work, a short rule is held against

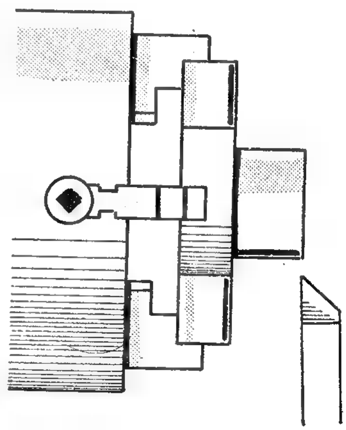


Fig. 12. *Turning the guide collet boss*

the parallel side of the lug and the tap is sighted against the edge of the rule in two positions at right-angles to one another.

Machining the Swarf Ways

Although the swarf ways, which allow the chips

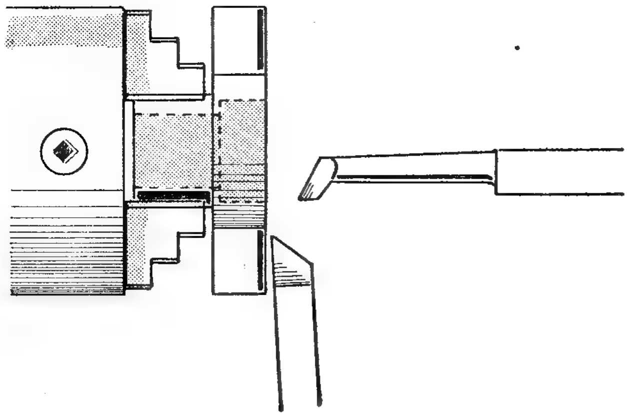


Fig. 13. Machining the die and collet housings

reversed in the chuck and the other end is knurled. As the work-piece is relatively slender, it will be apt to spring if an ordinary, forked knurling-wheel holder is employed; moreover, a tool of this kind, when knurling steel, may exert very great pressure on the lathe mandrel bearings.

These difficulties can readily be overcome by using a knurling tool of the pattern that carries the knurls in two pivoted arms; the knurls are then closed by a screw so that they exert equal and opposite pressure on the work.

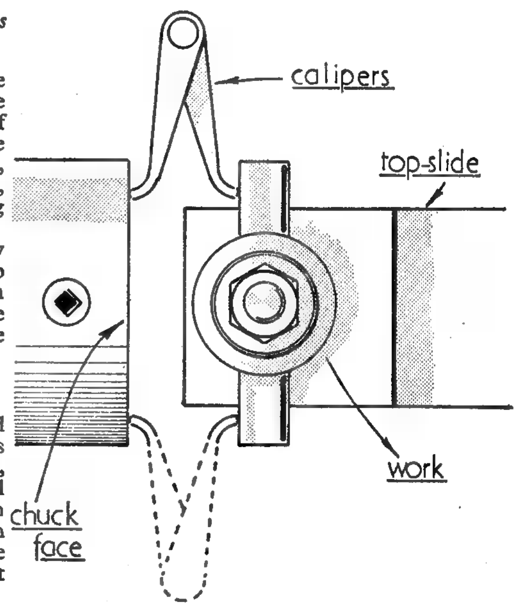
At the point where the knurling ends, the surface should be smoothed

to fall clear on the underside of the die, can quite well be filed to the dimensions given in the drawing; a neater job will, perhaps, be made if the surplus metal is removed by machining in the way shown in Figs. 15 and 16. For this purpose, the casting is secured to the lathe toolpost, and, if necessary, packing strips are used to bring the slots to the correct height.

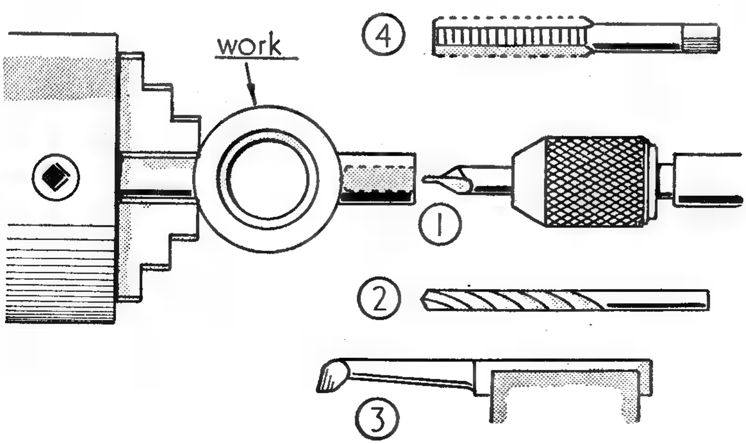
The work is set squarely across the lathe by applying the inside calipers between the two turned lugs and the face of the chuck. It is then an easy matter to machine the swarf ways to the given dimensions by using an end-mill of the correct size.

Fitting the Handles

The body casting has already been bored and tapped to receive the two handles. The handles themselves are made of mild-steel rod which, if the through way in the lathe mandrel will allow, is gripped in the chuck so that the end can be reduced in diameter and then threaded with the tailstock die-holder, in accordance with the dimensions given in Fig. 17. The work is next



Above—Fig. 15. Setting up the casting in the lathe toolpost



Left—Fig. 14. Machining the lugs for the handles

by applying ■ fine file to the rotating work, and ■ final polish is given with ■ strip of worn, abrasive cloth well supplied with oil.

If the rod is too large to enter the lathe mandrel, a centre should be drilled in the projecting end of the work and the tailstock brought up to give additional support. When the handle is finally screwed into place, the shouldered end should butt squarely against the machined end of the handle lug; in this way, the bronze lug will be greatly strengthened and will be fully strong to resist the pressure applied for cutting screw threads.

(To be continued)

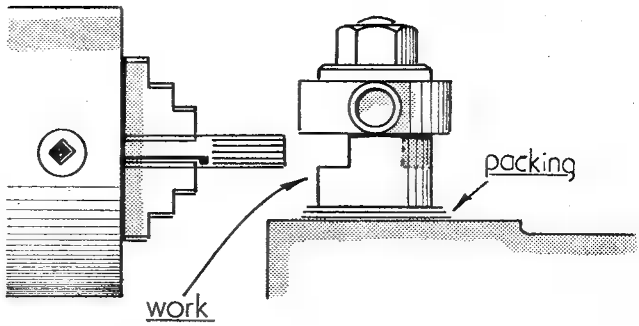
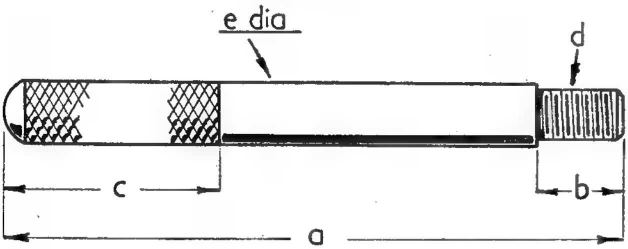


Fig. 16. End-milling the swarf ways



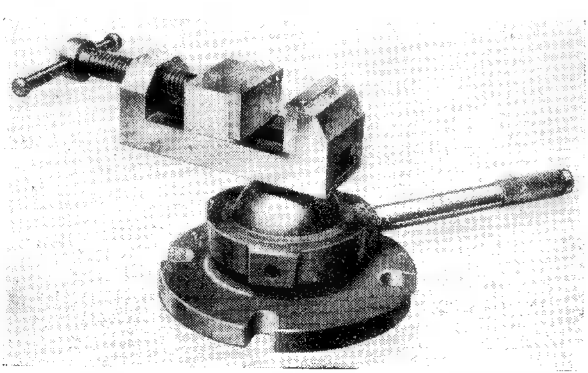
	a	b	c	d	e
A	$2\frac{7}{8}$"	$\frac{7}{16}$"	$1\frac{1}{8}$"	1/4" BSF	$\frac{5}{16}$"
B	$3\frac{1}{2}$"	$\frac{9}{16}$"	$1\frac{3}{8}$"	5/16" BSF	$\frac{3}{8}$"
C	$5\frac{1}{2}$"	$\frac{11}{16}$"	2"	7/16" 26T	$\frac{1}{2}$"

Fig. 17

The "Staffa" A.M.C. Swivel Vice

THIS is ■ recent addition to the range of Staffa Machines and Products, manufactured by Chamberlin Industries Ltd., Staffa Road, Leyton, London, E.

This vice has ■ round base, the diameter of which is 5 in., with four holes for fixing. One main feature is the 2 in. diameter ball with tapered hole for No. ■ Morse tapered shank. The upper part of the base forms ■ ring which has a spherical portion of the same radius as the ball. The clamping ring has ■ similar spherical portion and ■ circular scale on the upper face. The ball is clamped by the ring-nut which pulls the threaded clamping ring down. The tapered hole in the ball allows for fixing various attachments by means of a tapered shank, Morse No. 2, which forms part of individual accessories. The protruding part of the tapered shank has a threaded portion with a nut to take out the attachment from the ball. The swing or movement of the ball is 90 deg., 45 deg. from the centre-line, and the ball can be clamped in any position within this limit. The ring-nut can be opened by hand or tommy-bar. One meridian and parallel of latitude lines are engraved on the ball for setting the attachments at the required angle; thus, the centre-line can be adjusted true with the base, fixed in any position round the centre-line within the limit of 1 deg., or inclined up to 45 deg. from the centre-line.



Further particulars may be obtained from the manufacturers on application to the above address.

Queries and Replies

Enquiries from readers, either on technical matters connected with model engineering, or referring to supplies or trade services, are dealt with in this department. Each letter must be accompanied by a stamped, addressed envelope, and addressed: "Queries Dept.," THE MODEL ENGINEER, 23, Great Queen Street, London, W.C.2.

Queries of a practical character, within the scope of this journal, and capable of being dealt with in a brief reply, will be answered free of charge.

More involved technical queries, requiring special investigation or research, will be dealt with according to their general interest to readers, possibly by a short explanatory article in an early issue. In some cases, the letters may be published, inviting the assistance of other readers.

Where the technical information required involves the service of an outside specialist or consultant, a fee may be charged depending upon the time and trouble involved. The amount estimated will be quoted before dealing with the query.

Only one general subject can be dealt with in a single query; but subdivision of its details into not more than five separate questions is permissible. In no case can purely hypothetical queries, such as examination questions, be considered as within the scope of this service.

No. 9918.—Dynamo Overheating
A. C. (Goole)

Q.—I have installed a 120 V, 10 A dynamo, but it is heating up after being run a short time. Can you tell me the reason for this and any way of preventing it? Would this be over-loading on the armature, or should a dynamo of this amperage have a fuse? Would it be possible for this dynamo to be run too fast, or with too tight a belt?

R.—If the dynamo is a new one, there is little likelihood of it being at fault. On the other hand, if it is a used machine, it could be faulty in some way. A dynamo on load will show a certain amount of heating, and in some instances, it may not be possible to place the hand for long on the field coils for example, but at this temperature things will be normal. There are so many factors that govern heating. Any source of supply must have fuses in the respective circuits. A tight belt could account for heating, as could overspeed; under these conditions, the machine will be doing more work on load, and also the field coils will be compelled to carry more than their safe current. If the name-plate voltage is stated to be 120 V a meter should be used to see what voltage is being reached. At the speed you are driving, it should not exceed 130 V. Normally, you would generate at 130 V and carry out regulation by shunt regulator to any voltage down to 120 V.

No. 9919.—A Surplus Motor
R. A. S. (E.13)

Q.—I have an ex-Air Ministry motor alternator, which I wish to use as a general-purpose workshop motor, such as for driving grindstone, buff, etc. The first and main query is as to size of the starting and running condensors, and are they both essential? I realise, from recent queries re squirrel-cage motors, that these should be at least 400 V. Secondly, I realise that from 0.64 A input, I cannot expect a large h.p. output, but is it possible to use the alternator as a motor on 200 V 50 cycles, 1-phase, and so boost the power output? The methods I had in mind for this were: filling in the slots on the rotor at the alternator end of the shaft, or, fitting a new and larger rotor (the present one is only about 1½ in. long and has 26 slots), or, probably the only effective way, rewinding and either of the above. This last would do away with the need for separate excitation. The diameter of both rotors is about 2½ in., the motor end being about 3 in. long.

R.—As the motor was designed to operate with condensers, they cannot be dispensed with. The capacity cannot be estimated unless the inductance of the winding is known, and any attempt to apply them would be experimental. If you can find the manufacturers of this motor, they would advise as to the values necessary. It would be possible to fit a squirrel-cage motor to the alternator end, but unless the rotating field system, as now fitted, is laminated, it will be of no use. If this system is laminated, you could fit copper bars or rods in the slots and fit suitable and copper rings to which the bars would have to be riveted and soldered. Without a starting winding, the motor would not be self-starting, but as the current input is small, it could be started by twisting the shaft by hand.

No. 9920.—A Water Bath
K. J. H. (Taunton)

Q.—I wish to construct a small water bath, heated by mains electricity (230 V a.c.). It is proposed to use an element, similar to that in a domestic electric iron, clamped to the bottom of the bath, which is of copper sheet. The temperature is to be controlled between 35 deg. and 40 deg. C. by means of a capsule expanding to break the current. Could you tell me:—

(1) The type, length and size of wire which would be required for the heating element, 100-150 W.

(2) A suitable fluid for filling the capsule so that it operates between 35 deg. and 40 deg. C.

(3) The address of a firm which would supply me with a suitable element and thermostat already made up.

R.—In reply to your queries :—

(1) As you do not give the size of the former you propose to use for your heater, a suitable wire size cannot be given. The wire size will vary as the size of the former. For the loading you have in mind, the wire would be Nickel-chrome and could vary between 36 and 42.

(2) So far as the capsule style of regulator is concerned, we believe, in the case of refrigerators and similar low temperature applications, the same medium is used as is used in the compressor itself. It could be Freon or Methyl-chloride. It is doubtful if these capsules could be made and calibrated by an amateur. We suggest that you contact any firm dealing in tropical fish tanks, as low temperature controls are specially made for this application.

(3) If you care to contact The Metway Electrical Industries Ltd., King Street, Brighton, we feel sure they will be able to offer you, from stock, a suitable heater. One of their ranges, known as the "Clem Type" would be suitable and has a loading of 100 W. They also have a range of soldering-iron elements that would also be suitable; these are obtainable in 65, 100, 125 and 150 W.

PRACTICAL LETTERS

What Price Efficiency?

DEAR SIR,—(1) If the quantity of fuel remaining in the firebox is sufficiently important to measure, would not the following measurement be better than none? Weigh the locomotive fully found for the road, but cold, at some convenient "glass," and with firebox empty and clean (and coal bunkers of tank). Immediately the finishing point of the trial is passed, weigh again and correct for "glass" and pressure (emptying, of course, the coal bunkers of a tank). The difference is the fuel in the firebox; subject, of course, to the conscientiousness of the driver in damping down as much and as fast as possible, immediately the finishing point is passed, so that the residual fuel in the firebox shall be diminished as little as possible by post-trial combustion.

(2) Efficiency formulae that take cylinders, etc., into account are certainly unsatisfactory. They produce not a pure fuel-train curve, but a fuel-train curve on certain assumptions, namely, those which happen to be embodied in the formula by the particular way in which the drivers, etc., are reckoned in it. As Mr. Finch points out, pure fuel-train figures are the important ones. But whilst they enable one locomotive to be compared with another in fuel-train terms, one may reasonably ask for a little more information about the respective locomotives. This additional information must, however, be fundamentalised if it is to be helpful for comparative purposes.

A locomotive's possibility of performance is primarily shown by the total swept volume of all its cylinders, V. Inadequate boilering (or too many cylinders for the boiler), grating, mechanical efficiency, etc., are its designer's and maker's affair, and the discipline of the load-gauge will prevent freak ways out of them. The possibility of using its performance is shown by the number of drivers, D, and its weight, W. How much of W (the cold weight in (1) above would serve) is adhesive, is again the designer's and maker's affair. Therefore let VDW, which will be read as a mere number, be the "class-figure" of the locomotive. Locomotives of the same class-figure will be identical in terms of possible usable power; and a higher class-figure will be preferable to a lower one; but where "there is nothing in it" between two fuel-train curves, the one labelled with the lower class-figure will be the more meritorious. But, although the class-figure will arrange locomotives in a correct sequence of usable possible power, the numerical interval between any two numbers will have no meaning beyond showing the sequence and its direction. That, however, is a lack but not an objection; fuel train curves labelled with the class-figures of the locomotives which respectively attained them are more interesting than those not so labelled.

If, however, all locomotives are assumed to run with their safety-valves set to blow off at P lb./in.^{2}, and x is in fact the blow-off pressure of the locomotive concerned, then Px/P can be introduced into the class-figure, making it $(Px/P)VDW$. There is now a crude, but reasonably fair and useful, proportionality between the class-figures—and also so wide a field for argument (e.g. is P to be the same for all gauges? Is Px/P the proper way of bringing P in?) that one had better stop.

Yours faithfully,
"CORREGIS."

Model Locomotive Efficiency

DEAR SIR,—The method described by Mr. Finch of assessing the comparative efficiencies of locomotives is admirable, but I feel that owners would be more interested in such tests if they revealed the *actual* efficiencies of their models.

I have no doubt it would be possible to obtain a fuel of known heat value for the tests (I think 14,000 to 15,000 B.T.U's/lb. is approximate for steam coal) which value, multiplied by 778.3 would give the equivalent work in ft. lb.

The tractive effort, which would be required, would take rather more arriving at. However, a possible solution would be the inclusion of a "Salter" balance anchored on the driver's truck and coupled to the tender. Possibly some enterprising reader can suggest something more practical?

Now if Mr. Finch's formula were altered to

$$\frac{TE \times D \times 100}{F \times CV \times 778.3}$$

where TE = tractive effort
D = distance in feet.
F = fuel burned (lb.)
CV = calorific value of fuel in B.T.U.'s/lb.

then the resultant figure would be the efficiency of the locomotive expressed as a percentage.

Furthermore, if the tests were timed, the simple formula,

$$\frac{TE \times D}{t \times 33{,}000}$$

where t = time taken (mins.) would give the horsepower developed.

These results would, of course, be very approximate, but none the less interesting; and would, also, give owners an indication of what type of fuel their locomotives burn most efficiently, in addition to serving the same purpose as Mr. Finch's, i.e. to turn one's rival and declare the superiority of one's engine, or on the other hand to turn away quickly and say nowt!

Here are some heat values I have turned up :—

Welsh steam coal	14,490 B.T.U.'s/lb.
Anthracite	15,200 „
Coke	13,600 „
Pinewood	8,000 „
Charcoal	14,000 „

Yours faithfully,

Leeds. PHILIP LONGTHORN.

Model Cars and Model Engineering

DEAR SIR,—First, I must thank you for your good offices in forwarding to me communications about previous letters of mine which you have been pleased to publish.

On the subject of "Model Car Racing," Messrs. Mainwaring, "C.R.C.", Westbury, Rippon and many others seem to be suffering from or abetting an illusion. The whole point really revolves around this journal. Shall it define its title to mean "One who *makes* from metal small scale copies of standard industrial products or such similar objects as may reasonably be classed as such" or "One whose avocation revolves around the construction or operation of miniature mechanisms."

The field for the first definition is wide enough for the limited space available. Most of us have an active interest in one line only and often not more than a faint curiosity in the rest of the articles. The number of articles which are "blow by blow descriptions" is a clear indication that the majority of the readers have little or no mechanical aptitude or knowledge. It is a well-demonstrated fact in this world that he who knows least thinks he knows most.

I agree with Mr. Mainwaring that the home-made object is often worse than the tailor-made product, but does he accept the wastefulness of the shop-made engine as inevitable? I can name a friend of mine who can prove to him that the home-made engine can be five times as economical and that much more reliable than a wide range of popular production models.

Mr. Todd and others want articles on camera making. I hope that they get them, but please don't follow up with articles on developing and printing. They are already well catered for.

The model car problem boils down to this: Shall this journal be THE MODEL ENGINEER or "The Model Speedway News." Would you like your readers to vote on it?

Yours faithfully,

London, E.6. A. E. CLAWSON.
(A.M.Inst.Mechs., Grad. I.Prod.E., Grad.I.E.D.)

Model Engineers and Others

DEAR SIR,—May I offer my support to Mr. Westbury, and others who maintain that model car racers are not necessarily model engineers. The essence of model engineering is *making* models. The professional draughtsman in the C.M.E.'s department who draws a general arrangement of a locomotive to the usual scale of 1 in. to 1 ft. is definitely not a model engineer, but if he starts to *make* the locomotive to this scale he becomes one in his own right.

The driver of a full-size race-car need not be an engineer, and most of them are not; all that is necessary is that he should be an expert driver. Few of these drivers would claim to be engineers, and it is certain that they would not expect to have their doings recorded at length in the engineering press.

In the same way the model car racer need know nothing whatever about how to *make* a race car, all he needs to know is how to *run* one. He need be no more a model engineer than the lad who winds up a clockwork locomotive, and has no more claim on the space of a journal which is devoted to the needs of those who *make* models.

Drilling Holes

While I am writing to you may I refer to another matter? On page 569 of the May 3rd issue of THE MODEL ENGINEER, over the innocent title of "Fig. 6," there is a photograph due to Messrs. "Duplex" of a fantastic contraption set up to drill three small holes in about $\frac{3}{8}$ in. of cast-iron. I have some reputation, both professional and amateur, as a gadget merchant, but never in my wildest moments have I set up such a monstrosity to drill three little holes which I could have done in about five minutes with a hand brace. Come off it, Duplex!

I must say that I have been much impressed by the tremendous flow of devices produced by these duplicate gentlemen, and by their high standard of workmanship. I am reminded of an incident at last year's "M.E." Exhibition which amused me very much at the time. A visitor from the Midlands was interested in some of the work of "Duplex" which was on show, and as both halves of "Duplex" were present at the time they were pointed out to him. He eyed them for a time and then said, "Which is craftsman?" Perhaps he had been given a preview of "Fig. 6."

Yours faithfully,

London, S.E.9. A. L. HUTTON.

Those "Ladies"

DEAR SIR,—I read with great interest the paragraph "Astonishing Mileage" in your issue dated January 25th last. It is with real regret that I learn of the withdrawal of No. 2908. I knew her in 1906, when, I believe, she belonged to Plymouth. Other "29ers" that come to mind are :—*Lady Godiva*, *Lady of the Lake*, 2910 *Lady of Shallot*, and shouldn't 2906 be *Lady of Lyons*, also of Plymouth ?

I was cleaning at Old Oak when the "Ladies" first came out. Engines were cleaned in those days ; Bill Loveday and Rudge saw to that. It was also with real regret that I saw the state present-day engines get into, when I visited Old Oak last summer.

The "boys," as the cleaners that carried the board were called, did a grand job for 2d. per hour. Most of them are now retired, like the "Ladies."

Wishing THE MODEL ENGINEER all the best.

Yours faithfully,

Western Australia. G. F. ROUSELL.

[*Lady of Lyons* was No. 2907. We have been officially informed that the exact figure for the total mileage run by *Lady of Quality* was 1,862,449 miles—a fine record indeed !—ED., "M.E.".]

CLUB ANNOUNCEMENTS

The Society of Model and Experimental Engineers

A rummage sale will be held at the headquarters of the society, 28, Wanless Road, Loughborough Junction, S.W.9, on Saturday, June 16th, 1951, at 3 p.m. All lots for sale must be entered before 2.30 p.m. Visitors may attend but only members may take part in the bidding.

In view of the time which has elapsed since the last sale, always a popular feature, a good turn-out with plenty of lots is to be expected.

Members who have models suitable for the society's stand at the "M.E." Exhibition are asked to send details to the hon. secretary as soon as possible.

Forms of application for membership may be obtained from the Secretary, A. B. STORRAR, 67, Station Road, West Wickham, Kent.

Loughborough Model Engineering Society

At the annual general meeting the following officers were elected :—

Chairman, Mr. W. H. Smith, 22, Mountfields Drive, Loughborough ; treasurer, Mr. L. Eggelston, 14, Oaklands Drive, Loughborough ; secretary, Mr. J. W. Bailey, 139, Ashby Road, Loughborough.

Anyone interested in becoming a member should contact any one of the above officers.

The title has now been changed to The Loughborough Model Engineering Society.

We have recently obtained a clubroom and are now setting out to increase our equipment.

Hon. Secretary : J. W. BAILEY, 139, Ashby Road, Loughborough, Leics.

Cheltenham and District Live Steam Society

The above society will be holding a hobbies exhibition at the Town Hall, Cheltenham, from September 24th to 27th.

Hon. Secretary : K. L. RICHARDSON, 4, St. Pauls Street North, Cheltenham.

Newton Abbot and District Model Engineering Society

The society's third annual general meeting was celebrated by a supper for "members only."

In his annual report, the secretary, Mr. D. Knell, said the society was now well established and financially in the clear. Membership was increasing generally, but felt sure that if the proposed project to lay a 75 ft. diameter miniature car track within the perimeter of the society's railway track materialised, we should have a car track second to none in the south-west. This would attract new members from an, as yet, untapped source, and coupled with the almost completed railway track ideally situated, would have much advertising value for the club and become one of the major attraction centres of the town.

Like the track, the club locomotive is nearing completion.

During the year the society has purchased a welding outfit, so that all brazing and welding worries are now over for anything up to $\frac{3}{8}$ in. thick steel plate or any size copper boiler the society is likely to construct.

Looking into the future, the secretary said there are, for the winter session, October to April, a series of seven lectures, four film shows, and three open nights in course of preparation. Preparations were also in progress for a ten-day exhibition, August 22nd to September 1st.

Due to increased costs in production, the society's "Journal" had to be discontinued, but it is hoped by reorganisation to reintroduce the "Journal" in the near future.

Hon. Secretary : D. KNELL, 9B, Pinewood Road, Milber, Newton Abbot.

Hayes and Harlington Model Engineers Society

The society's track at Harlington has recently been under reconstruction ; the light rails have been removed and $\frac{3}{4}$ in. × $\frac{3}{8}$ in. rails are now being replaced using all-welded construction on steel sleepers, spaced 5 in. apart. Part of the new track has been tested with a passenger load—the riding is very good and high speed can be achieved with safety.

The society are holding their annual exhibition on June 16th, in co-operation with the Hayes and Harlington Festival of Britain celebrations. These exhibitions are always a super show and all local and distant societies are invited to send or bring along models of anything ; also, lone hands in modelling are welcome. L.M.R. films are being shown and refreshments are on hand.

The exhibition is at Townfield School, Coldharbour Lane, Hayes, near the "Grapes," Uxbridge Road, or a short 'bus ride (Nos. 140, 120 and 55) from Hayes station.

A club locomotive, *Speedy*, a G.W.R. 0-6-0 tank in 5-in. gauge, has been started. Main frames, complete with axle-boxes and stays, wheels and axles and oil pump, are now in hand ; also, patterns are being made for cylinder castings.

The society is a very go-ahead locomotive club and anyone who is interested is welcome to the club meetings held on the first and third Thursdays in each month at the Church Hall, Cherry Lane, Harlington, Middx., or write to the Hon. Secretary, R. W. NASH, 26, Goshawk Gardens, Hayes, Middx.

Blackheath Model Power Boat Club

The above club are holding their annual M.P.B.A. regatta on Sunday, June 24th, 1951, at the Princess of Wales Pond, Blackheath.

Competition events commence at 11 a.m. and continue throughout the day. Programme for the day includes :—

Nomination competition.
300 yd. "C" class hydroplane race.
300 yd. "D" class hydroplane race.
300 yd. "C" class (restricted) hydroplane race.
Steering competition.
500 yd. "B" class hydroplane race.
500 yd. "A" class hydroplane race.

Competitors in the racing events will be allowed to nominate the start of the run (when timing commences) at either the $\frac{1}{2}$ lap or $1\frac{1}{2}$ lap position.

The maximum time allotted to each racing entrant will be two three-minute periods on the line.

A special prize will be awarded to the competitor who starts, adjusts and releases his craft in the shortest possible time, provided the course is completed to the satisfaction of the timekeepers.

Hon. Secretary : A. A. RAYMAN, 59, Marillo Road, Lee, S.E.13. LEE Green 5401.